



NOTICE INVITING TENDER

Ref.: OS/26-27/8194/Coils/16/016

Date: 16.07.2026

Sub: Fabrication of Super Heater & Economizer Coils against S.O. No. 8194 at Vendor works with free issue materials – Reg.

Dear Sir,

Sealed tenders are invited for the subject work in **Two-part bid** system from Bidders who are having **valid IBR registration certificate issued by DOB of concerned state** for Manufacturing of Boiler components and having manufacturing facility i.e., shop floor / workshop along with required machinery, tools, tackles and skilled manpower and also fulfil the Pre-qualification criteria specified below in clause-1. Scope of work and techno-commercial terms and conditions are as follows:

1. PRE-QUALIFICATION CRITERIA:

- 1.1 Bidders must have an experience of successful completion and continuity of Manufacturing of similar IBR jobs i.e., **Fabrication of Coils for Boilers of Process Industries / Power Plants** during last 7 years ending **30.06.2026** for a minimum of one project. Bidders shall enclose Work Order, Work Completion Certificate and all other relevant documents from the customer and IBR Inspection documents in support of successful & satisfactory completion of the work. The works executed in own name of the individual / firm of the tenderer will only be considered for eligibility criteria.
- 1.2 Bidder shall have Tube bending machine at their works. Bidder shall confirm the availability and provide details of the same.
- 1.3 Average Annual Financial Turnover of the bidder for the last 3 financial years should be a minimum of ₹ **300 Lakhs**. Bidders shall enclose Financial turnover certificate for previous three years issued by Chartered Accountant / Audited Profit & Loss Accounts, Balance Sheets and other necessary documents in support of the same.
In case audited financial statements are not available for latest financial year, then the applicable audited statements of preceding three financial years shall be considered.
- 1.4 Bidder shall enclose the documents of **valid IBR Registration certificate issued by DOB of concerned state** for Manufacturing of Boiler equipments & components, PAN, GSTIN, UDYAM Registration Certificate (if registered with MSME) etc.
- 1.5 Any Bidder falling under MSE category shall furnish the following details & submit documentary evidence/ Govt. Certificate etc., in support of the same along with their Techno-commercial offer.

Type under MSE	SC/ST Owned	Women Owned	Others (excluding SC/ST & Women Owned)
Micro			
Small			

Note: If the bidder does not furnish the above in the tender, offer shall be processed construing that the bidder is not falling under MSE category.

2. LOCATION OF WORK SPOT:

The fabrication work is to be carried out at vendor works.

3. VENDOR'S SCOPE OF WORK: Detailed scope of the fabrication work will be as follows:

3.1) **Fabrication of Super Heater & Economizer Coils: 500 MT (approx.)**

It may be noted that the weight indicated above is tentative and may vary on both sides. However, payment shall be made for the actual executed quantity only.

- 3.2) Complete Fabrication of Coils as per relevant drawings, QAP, WPS, Procedures, Painting Schedule, IBR Specifications & Standards. It includes the following activities but not limited to the same:
- 1) Collection and Transportation of all free issue materials from BHEL-HPVP Stores, Visakhapatnam along with relevant IBR documents to Vendor works and Unloading of the same at Vendor works.
 - 2) Free issue materials cleared by HPVP-QC (Stores) to be collected within 3 days from the date of intimation without any failure.
 - 3) Vendor is responsible for fabrication of Coils strictly as per BHEL issued drawings, approved QAP & WPS.
 - 4) The Welding Procedure Specification (WPS) shall be prepared by the vendor. TPI approved PQR along with NABL documents and test reports shall be submitted to BHEL for approval prior to starting of welding.
 - 5) All consumables like Electrodes & Filler wires, Gases, Grinding/cutting wheels etc., required for fabrication are in the scope of the Vendor. The welding consumables shall be sourced only from Brand / batches of having valid IBR certificate and the vendor shall submit the Batch Test Certificates to BHEL for verification.
 - 6) Welding shall be carried out by IBR certified welders only and the qualification documents are to be submitted to BHEL-HPVP.
 - 7) All fabrication, inspection, and testing activities shall comply with relevant quality documents (CQP, SQP, SIP, QCP). Form 3B shall be under vendor scope.
 - 8) Coordination and arrangement of IBR inspection for intermediate stages and Final stage of Fabrication is in vendor's scope. Customer stage wise inspections to be cleared as per QAP.
 - 9) The vendor shall maintain a history card for each job, documenting all activities including rework. Compliance with manufacturing guidelines and GMS notes is mandatory.
 - 10) Submit cutting plans for the collected materials to BHEL for approval before fabrication. Wherever fabrication is done without proper approved cutting plans, any loss of materials arising due to the same will be recovered as per BHEL recovery rates.
 - 11) Vendor should return the excess / balance materials including off-cuts and total scrap available with the vendor exclusive of process allowance & invisible wastage to BHEL-HPVP Stores after material reconciliation but before submission of their final bill. In case the same are not returned by the vendor, Recovery shall be made as per BHEL Rates / MSTC rates plus applicable taxes, prevailing at the time of processing of the final bill.
 - 12) Marking of all off-cuts with melt numbers & material specifications by letter painting and return them to BHEL HPVP Stores at Visakhapatnam. Transportation and Handing over of off-cut materials and scrap at BHEL-HPVP, Visakhapatnam is in vendor scope.
 - 13) Verification of Raw material details and specifications. Report any defects immediately to BHEL. Ensure proper colour coding and melt transfer for material traceability. Vendor shall follow all IBR inspection formalities.
 - 14) FoT wherever required has to be performed and details of the same has to be submitted along with necessary full documentation. Tubes for FoT shall be given once on No Cost basis and shall be treated as Scrap post fabrication for material accounting.
 - 15) Cutting and edge preparation of tubes as per drawing. Any butt joint and joint locations must be approved by BHEL Engineering beforehand.
 - 16) Preparation of Joint Plan and submission of the same to BHEL for approval.
 - 17) Build tubes to the required length by butt welding (TIG or straight tube butt welding machine). Perform 100% Radiographic Testing (RT) using only BHEL-approved sources. RT films shall be evaluated by BHEL NDTL. Repair and re-test until approval.
 - 18) Form the Coil circuits using a Tube bending machine as per drawings.
 - 19) Intermesh and assemble individual circuits to form the coil with all required attachments as per the drawing. Vendor shall prepare attachments from plate items as per drawing.
 - 20) Inspect the coil for visual inspection.
 - 21) Remove burn-through areas, if any, and replace with spool pieces of minimum 300 mm length. Perform 100% TIG welding and 100% RT.
 - 22) Inspect coils thoroughly and identify repair quantum (undercut, burn-through, weld skips, porosity, etc.).

- 23) In case any additional tubes or other raw materials are required for repairs arising during fabrication and such repairs are attributable to the vendor, the required materials shall be supplied by BHEL only on a chargeable basis at additional cost.
- 24) Perform weld repairs and bow correction as required.
- 25) Carry out ID corrections as per drawing.
- 26) Conduct spectro tests for all attachments and weldments in case of LAS material.
- 27) Perform visual inspection and LPI on welds in presence of BHEL NDT or approved agencies.
- 28) Execute any necessary width corrections, trimming, and length cutting.
- 29) Offer dimensional inspection to IBR.
- 30) PWHT of Coils as per the approved heat cycle, QAP & drawings.
- 31) Conduct hydraulic testing and obtain clearance from BHEL-QC. Wherever required as per drawing/specification, the coils shall also be offered to IBR for necessary inspection and clearance.
- 32) Excess tube lengths marking, cutting & beveling after hydro test as per drawing.
- 33) After completion of all processes, offer the coils to BHEL-QC for final inspection. The vendor must perform any rework as instructed by BHEL QC and re-offer.
- 34) Any Re-SR due to vendor induced defects at any stage is under vendor scope.
- 35) Provide necessary identification by letter painting in a prescribed / specified format on the panels.
- 36) Adhere to all tests in the QAP including ball test, LPI, sponge test and offer for inspection at specified stages.
- 37) IBR inspection Fee payment shall be borne by the vendor and necessary inspection clearances to be obtained at required stages.
- 38) Put VCI pellets, close the Tube ends with end caps, provide identification and colour coding. Supply of VCI pellets and End caps is in vendor's scope.
- 39) Surface preparation by Blast Cleaning and Painting of Primer & Finish Paints by qualified painters as per approved Painting Schedule / standards. All tests required as per Job Specifications and BHEL Painting Procedure shall be carried out by a qualified agency for testing of painting and obtaining stage wise inspection clearance from HPVP (QC) / TPIA / IBR as per approved drawings & QAP. **Paints shall be Free Issue by BHEL.**
- 40) All tests to be conducted at various stages in NABL approved laboratories is in vendor's scope.
- 41) Loading of finished items with required packing as per drawing onto the trailer by providing necessary manpower, tools & tackles and Welding of temporary supports required for transportation of the same to the customer. Trailers shall be arranged by BHEL.
- 42) Materials required for Packing and Stacking of Coils for transportation purpose, if any is in vendor's scope.
- 43) The Vendor shall submit all original inspection documents including all relevant IBR forms duly approved by Director of Boilers of the concerned state, History card, Weld map, Dimension reports, NDE reports, Customer/IBR clearances, IR & DC etc.
- 44) Though not mentioned specifically, any activity which is required for completion of the work is deemed to be included in the scope of work of vendor without any price implication.

4. BHEL SCOPE:

BHEL – HPVP shall provide the following as free issue:

- 4.1 Drawings, GMS, QAP, Painting Schedule, applicable Procedures, Standards & Specifications.
- 4.2 All Raw materials e.g., Tubes, BOCs, attachments as per GMS and required Paints as per Painting Schedule at BHEL - HPVP stores, Visakhapatnam.
However, Transportation of these materials from BHEL-HPVP stores to Vendor works is in vendor's scope.
- 4.3 Transportation of Finished Coils from Vendor works to customer.

5. INSPECTION:

- 5.1 Inspection shall be carried out by M/s. BHEL-HPVP, Vizag / BHEL Authorized Inspection Agency (TPIA) / Customer & IBR as per approved QAP. Vendor's scope includes co-ordination with IBR officials for Stage wise & Final Inspection and obtaining inspection clearances before proceeding for further operations along with all necessary documentation.

- 5.2 Fabrication Vendor shall be solely responsible for preparation and submission of all Inspection Reports & documents duly certified by Inspection Authority along with the finished items.
- 5.3 All the documentation related to inspection clearance of M/s. BHEL/TPIA/Customer & IBR, Generation of Inspection Reports, Preparation of Final Documents as per BHEL standard formats and IBR Forms is in vendors scope. Vendor shall submit all original inspection documents including all relevant IBR forms duly approved by Director of Boilers of the concerned state, History card, Weld map, Dimension reports, NDE reports, Customer/ IBR clearances, IR & DC etc., to BHEL-HPVP.

Note: Drawings enclosed with the tender document are tentative only and may be subject to revision due to incorporation of comments of the approving authority. Hence, the approved drawings and QAP issued to the vendor after ordering shall only be followed for execution and inspection of the job.

6. **DELIVERY:**

- 6.1 Delivery period shall be **within 4 Months from the date of issue of First consignment of free issue materials (or) 6 weeks from the date of issue of Last consignment of materials at BHEL-HPVP, Visakhapatnam whichever is later.**
- 6.2 Delivery period will be calculated from the date of issue of Raw materials at BHEL-HPVP, Visakhapatnam to the date of completion and readiness of job for dispatch at vendor's works.
- 6.3 All the Original Inspection documents and other relevant certificates are to be handed over to BHEL-HPVP as per the instructions at the time of delivery.
- 6.4 In case the delivery period offered by the vendor is more than the tender delivery, Price quoted by the bidder shall be loaded for additional period @ 0.5% per week or part thereof for the purpose of evaluation of Bidder Status.

7. **VALIDITY OF OFFER:**

The offer shall be valid for a period of **3 months** from the date of Reverse Auction.

8. **EARNEST MONEY DEPOSIT (EMD):**

- 8.1 The Bidder shall submit EMD for **₹ 6,00,000/- (Rupees Six Lakhs only)** along with their bids in the following forms only:
- Electronic Fund Transfer credited in BHEL account before tender opening (Bank Mandate is enclosed).
Fund Transfer details to be submitted along with the offer.
 - Banker's Cheque/ Pay Order/ Demand Draft, in favour of BHEL, Visakhapatnam (along with offer)
 - Fixed Deposit Receipt (FDR) issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Bidder, a/c BHEL)
 - Bank Guarantee from any of the Scheduled Banks
 - Insurance Surety Bonds
- 8.2 EMD by the Bidder will be forfeited, if:
- The bidder withdraws or amends its/his tender or impairs or derogates from the tender in any respect within the period of validity of the tender or if the successful bidder fails to furnish the required performance security within the specified period as per the order.
 - EMD by the bidder shall be withheld in case any action on the bidder is envisaged under the provisions of extant "Guidelines on Suspension of business dealings with suppliers/ contractors" and forfeited/ released based on the action as determined under these guidelines.
- 8.3 EMD given by all unsuccessful bidders shall be returned after expiry of the final bid validity period or within 30 days of award of the contract.
- 8.4 EMD shall not carry any interest.
- 8.5 EMD of successful bidders shall be refunded on conclusion of the order / receipt of Security Deposit.

Note:

- 1) Micro & Small Enterprises (MSEs) or Start-ups as recognised by Department for Promotion of Industry and Internal Trade (DPIIT) are eligible for exemption of EMD as given below:**

MSE suppliers can avail the intended benefits only if they submit **valid UDYAM Registration for Micro / Small** category and relevant certificate for Start-ups along with the offer. Non-submission of such documents will lead to consideration of their bid at par with other Non-MSE bidders. No benefits shall be

applicable against this tender enquiry if the above required document is not submitted before Price bid opening.

- 2) In case of submission of EMD as per 8.1 (b), (c), (d) & (e) above, the original documents are to be sent through Speed Post and the same shall reach within 07 days from the date of opening of Techno-commercial Bids to the following address:

The SDGM (Outsourcing), DAPG Building, HPVP Unit, BHEL, Visakhapatnam – 530012 (AP).

Otherwise, BHEL reserves the right to reject such offers without further correspondence.

9. **PRICE:**

- 9.1 The price shall be quoted in the **Price Bid** as per the Schedule of Quantities & Rates for the detailed scope of work and the quoted price shall be inclusive of all applicable taxes & duties except GST.
- 9.2 The prices shall be fixed & firm without any escalation during the entire period of contract and till completion of the work.
- 9.3 GST shall be reimbursable to the vendor as detailed in Clause - 11 and as per Annexure – GST.
- 9.4 Income tax will be deducted at applicable rates from RA & Final bills.

10. **EVALUATION, COUNTER OFFER & ORDERING:**

- 10.1 **L1 status shall be evaluated based on the total quoted value.**
- 10.2 For ordering, **Two (02) bidders** shall be considered and total Quantity shall be distributed to the two bidders in the ratio of 60:40.
- 10.3 Counter offer of L1 / negotiated rates shall be given to the respective L2 and next lowest bidders for acceptance. Vendor who accept counter offer rates shall only be considered for ordering.
- 10.4 In case any of the next lowest bidders does not accept the counter offered L1 / negotiated rates, Total Quantity shall be ordered on L1 bidder only.
- 10.5 BHEL reserves the right to cancel any order partly (or) in full in case the performance of any of the vendors is not satisfactory in meeting the quality requirements or committed delivery schedules and to distribute the same quantity among the balance eligible vendors.

11. **GOODS & SERVICES TAX (GST):**

Bidders shall make a note of the following points of GST before submission of their offer:

- a) Vendors shall have to mention their GSTIN no. (15 Digits) in their Technical Bid. If any specific exemption is available, a declaration with due supporting documents need to be furnished for considering the offer.
- b) Semi-finished goods are to be delivered by the Vendors in BHEL, HPVP premises within a maximum period of one year from the date of issue of the material, failing which the whole transaction will be considered as Supply & Sale and GST is required to be paid along with interest (calculated @ SBI Base Rate + 6%) along with penalty, if any, from the date of Challan on the whole value of materials. Hence vendors shall have to ensure that materials issued to them are returned within 365 days.
- c) After fabrication, the vendors shall have to deliver the Semi - finished Goods by fulfilling the following formalities:
 - i) GST invoice should be raised by the vendors by paying GST on job work charges at applicable rates and by incorporating the HPVP GSTIN no. in the invoice for availing the reimbursement of GST from HPVP.
 - ii) The vendor shall also have to enter in their GST Return -1 (GSTR-1) the details of invoice raised for payment of GST so as to enable HPVP to avail input credit.

12. **REVERSE AUCTION:**

- 12.1 BHEL shall be resorting to Reverse Auction (RA) for this tender. RA shall be conducted among the eligible techno-commercially qualified bidders. Business Rules for Reverse Auction are given at Annexure – V. Refer Guidelines for Reverse Auction which is available on our website, www.bhel.com → supplier registration → Guidelines for Reverse Auction, before submission of offer.
- 12.2 Sealed envelope / Electronic Price bids of all the techno-commercially qualified bidders shall be opened and the same shall be considered as initial bids of the bidders in RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking.

- 12.3 BHEL will inform bidders the details of service provider who will provide business rules, all necessary training and assistance before commencement of online bidding. The bidders participating in the Reverse Auction shall have to necessarily submit '**Process Compliance Form**' (PCF) to the designated Service Provider.
- 12.4 Bidders are advised to read the 'Business Rules' (Annexure – V) indicating details of RA event carefully, before reverse auction event.

13. **RISK PURCHASE:**

In case the contractor fails to execute the work within the scheduled time or due to any other reasons, BHEL - HPVP reserves the right to get the same completed through some other party at the risk & cost of the contractor and any additional expenditure incurred due to the same shall be charged to the contractor. Non-performance of contract attracts penal provisions in line with BHEL Guidelines for Suspension of Business Dealings.

14. **GENERAL:**

- 14.1 The bidders shall study the Tender documents, Drawings, Quality Documents and all other relevant documents in detail for understanding the scope of work and the processes involved before submission of offer. Bidders shall get clarifications, if any, from concerned officials on the scope of work or any other details of the tender document, over phone between 09:00 AM and 04:00 PM on any working day or through e-mail.
- 14.2 **Conditional / Partial Price Bids** and any other deviations to the tender terms & conditions are not acceptable and BHEL reserves the right to reject such offers without further correspondence. Bidders shall confirm their acceptance to all the terms & conditions of the tender enquiry in the Techno-commercial Bids without any deviations.
- 14.3 BHEL reserves the right to modify or cancel the tender enquiry at any stage without assigning any reasons thereof.
- 14.4 The General Terms & Conditions, if any, contradicting with the specific terms & conditions given in the tender, then specific terms & conditions shall only be considered.
- 14.5 Other Terms & Conditions, whichever applicable, shall be as per Annexure – III enclosed.
15. The following documents shall form part of the tender enquiry including this Notice Inviting Tender:

PART - 1: TECHNO-COMMERCIAL BID

- | | |
|--|------------------|
| i) Schedule of Quantities | : Annexure – I |
| ii) Details of Panels to be fabricated | : Annexure – II |
| iii) General Terms & Conditions | : Annexure – III |
| iv) Acceptance to tender terms & conditions | : Annexure – IV |
| v) Business Rules for Reverse Auction | : Annexure – V |
| vi) GST Compliance for Indigenous Suppliers | : Annexure – GST |
| vii) Integrity Pact | : Annexure - IP |
| viii) Drawings, SQP, Painting Schedule, HT cycles, Proforma of BG for EMD etc. | |

PART - 2: PRICE BID

- ix) Price Bid (Schedule of Quantities & Rates)

16. **TENDER SUBMISSION (Through e-Procurement system):**

- 16.1 The tender completed in all respects shall be submitted in **Two parts** (Techno-commercial bid and Price Bid) through online e-procurement portal (<https://eprocurebhel.co.in>) latest by **13:00 Hrs. on 27.07.2026**.
- Note:** Techno-commercial bid along with all the tender documents shall be duly signed & stamped by the bidder on all pages.
- 16.2 Submission of offer by the bidder implies that all the tender documents were read by the bidder and the bidder is aware of the scope and specifications of the job.
- 16.3 **OFFERS SENT IN ANY OTHER FORM WILL BE TREATED AS INVALID AND WILL BE SUMMARILY REJECTED.**

17. **TENDER OPENING:**

- 17.1 Techno-commercial Bids will be opened on **27.07.2026 at 15:00 Hrs.** in online e-procurement portal.
- 17.2 After evaluation of the Techno-commercial Bids, intimation regarding date & procedure of conducting Reverse Auction shall be given by the service provider to all the eligible techno-commercially qualified bidders through an e-mail in advance at an appropriate time.

18. INTEGRITY PACT:

- a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl. No.	IEM	E-Mail ID
01	Dr. Sarat Kumar Acharya, Ex-CMD, NLC	iem1@bhel.in
02	Shri R. Mukundan, IRPS (Retd.)	iem2@bhel.in
03	Shri Madan Lal Meena, IAS (Retd.)	iem3@bhel.in

- b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/three-part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.
- c) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to the panel of IEMs. All correspondence with the IEMs shall be done through email only.

Note:

No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc. on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below:

Details of contact person(s):

Name:	1. S N V S Ramesh, SDGM	2. D N Murthy, Manager
Dept.:	Outsourcing Dept.	Outsourcing Dept.
Address:	BHEL – HPVP, Visakhapatnam - 12	BHEL – HPVP, Visakhapatnam - 12
Phone:	0891 – 288 1515	0891 – 288 1359
E-mail:	rameshsnvs@bhel.in	dnmurthy@bhel.in

For Bharat Heavy Electricals Limited,

Ramesh

(S N V S Ramesh)

SDGM (Comml. & Outsourcing)

S N V S RAMESH
SDGM (COMMERCIAL & OUTSOURCING)
BHEL - HPVP, VISAKHAPATNAM - 12
VISAKHAPATNAM - 530 012

SCHEDULE OF QUANTITIES

Tender enquiry ref: OS/26-27/8194/Coils/16/016

Date: 16.07.2026

Sub: Fabrication of Super Heater & Economizer Coils against S.O. No. 8194 at Vendor works with free issue materials

Sl. No.	S.O. No.	Description of Work	Unit	Qty.
1	8194	Fabrication of Super Heater Coils as detailed at Annexure-II of Tender enquiry	MT	310
2		Fabrication of Economizer Coils as detailed at Annexure-II of Tender enquiry	MT	190
		TOTAL	MT	500

Notes :

- 1) **L1 status shall be evaluated based on the total quoted value and Load distribution shall be as per clause no. 10 of the tender enquiry.**
- 2) The quoted price shall be inclusive of all applicable taxes & duties except GST. Income Tax shall be deducted at applicable rates from Bills and GST shall be reimbursable to the vendor as per applicable guidelines.
- 3) The prices shall be fixed & firm without any escalation during the entire period of contract and till completion of work.
- 4) The quantity indicated above is tentative and may vary subject to the requirement at the time of ordering / execution. However, payment shall be made for the actual quantity only.
- 5) The bidders are advised to go through all the drawings & documents before quoting the tender.
- 6) The evaluation currency for this tender shall be **INR**.

Signature of the Bidder with stamp

DETAILS OF COILS TO BE FABRICATED

Tender enquiry ref: OS/26-27/8194/Coils/16/016

Date: 16.07.2026

Sub: Fabrication of Super Heater & Economizer Coils against S.O. No. 8194 at Vendor works with free issue materials

Sl. No.	S.O. No.	PGMA	Description of Item	Approx. Wt. (MT)	Tube Material Specn.
1	Fabrication of Super Heater Coils				
1.1	8194	11-236	SH HOR SPACED UPPER COIL + ATCH	76.04	SA213T11
1.2		11-237	SH HOR SPACED INTER COIL + ATCH	79.45	SA213T11, SA210GRC
1.3		11-274	SH VERTICAL SPACED COIL + ATTACHMENT	36.23	SA213T11, SA213T22, SA213T91
1.4		11-278	VERT PLATEN CENTRE SH COIL ASSY+ATTACH	42.40	SA213T22, SA213T91, SA213TP347H
1.5		16-275	RH VERTICAL SPACED FRONT COIL + ATT	28.60	SA213T11, SA213T22
1.6		16-277	VERT REAR PLATEN RH COIL ASSY ATTACH	38.06	SA213T22, SA213T91
2	Fabrication of Economizer Coils				
2.1	8194	19-114	COILS AND SUPPORTS OF UPPER P.TUBE EC	112.38	SA210GRA1
2.2		19-124	COILS AND SUPPORTS OF LOWER P.TUBE EC	70.99	SA210GRA1

Note : The above weights are approximate and may vary as per the drawings issued at the time of order / during execution.

GENERAL TERMS & CONDITIONS**1. TECHNICAL DELIVERY CONDITIONS:**

The work should conform to the technical data given in our drawings, GMS, Shipping List Specifications, QAP, WPS etc.

2. PARTY'S SCOPE:

The scope of the party shall be as follows: -

- a) All welding equipments, baking oven, tools, jigs and fixtures, measuring instruments duly calibrated, handling facilities, testing facilities etc.
- b) All materials other than those mentioned under "Free Issue Materials", which are required for completion of the work.
- c) All consumables such as electrodes, gases, grinding wheels etc.

Note: Electrodes of specification mentioned in the drawings / WPS and of BHEL approved brands only shall be used and MTCs of the same shall be submitted to BHEL for verification before use.

3. REVISION OF DRAWINGS:

There may be minor changes in the drawings during execution. In such a case, party should accommodate the same without any extra claim.

4. WELDING QUALIFICATION: Qualification of required number of Welders is party's responsibility at their cost.**5. X-RAY:**

All welding shall be of X-ray quality where specified on drawings. Inspection would specify the quantum of X-ray based on drawings / code requirement. Party should strictly follow the WPS and QAP issued by BHEL during welding. Getting the welds radiographed and getting them cleared by inspection is the responsibility of the party.

6. RECTIFICATIONS / REJECTIONS:

Any rectification due to defective work, if required, shall be done by the party free of charge with a suitable technology approved before hand by BHEL in writing. The cost of material, if any used for rectification work / rejection work, will be estimated by BHEL and the same shall be debited to party's account. In case any rectification / rework is to be carried out due to defective material supplied by BHEL, the replacement material and consumables will be supplied by BHEL free of Cost.

7. SECURITY DEPOSIT:

- a) Vendors shall have to submit a Bank Guarantee for **10%** of the order value in case of **HPVP ADM / Lovagarden site** (or) **25%** of the material cost in case of Vendor works towards Security Deposit and safe custody of free issue materials within 15 days from the date of intimation by Outsourcing dept. The BG shall be valid for the contract period with a claim period of 12 months. This Bank Guarantee shall be released to the contractor after completion of work and on acceptance of the same by BHEL / Owner.

Bidder agrees to submit performance security required for execution of the contract within the time period mentioned above. In case of delay in submission of performance security, enhanced performance security which would include interest (Repo rate + 4%) for the delayed period, shall be submitted by the bidder. Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered from the first bill along with due interest.

- b) **MODE OF DEPOSIT:** Security Deposit may be furnished in the following forms:

- i) Local cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL.
- ii) Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL.
- iii) Fixed Deposit Receipt issued by Scheduled Banks / Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL).
- iv) Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL).
- v) Insurance Surety Bond.

(Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith).

8. PERFORMANCE BANK GUARANTEE:

Vendors shall have to submit Performance Bank Guarantee (claim period of 12 months) for 10% of the order value covering for the defects liability period. If PBG is not submitted, 10% of the order value shall be deducted towards PBG from the final bill and shall be refundable after performance guarantee period, if no defects are found during this period.

9. RAW MATERIALS ISSUE:

Raw materials shall be issued with appropriate processing allowance and invisible wastage over the theoretical requirement of raw materials (**Plates, Sheets, Sections and Pipes**).

10. TRANSFER / RETURN OF LEFT-OVER MATERIALS:

Party should maintain proper records for receipt & use of all free issue materials. The left-over materials & scrap as per the material accounting statement shall be returned to HPVP stores along with finished job. Material Transfer Vouchers (MTV) from one order to another or from one vendor to another and Material Return Vouchers should be submitted immediately after transfer / return. The material reconciliation statement shall be submitted by the contractor after verification and certification by BHEL along with the final bill **within 30 days from the date of completion of work**. Otherwise, recovery for the balance materials shall be made from any of their pending bills without further intimation.

11. MATERIAL RECONCILIATION:

Orders issued to the vendors have to be completed in all respects including Material Accounting within a maximum of **180 days** from the **date of issue of material** from BHEL - HPVP stores.

Maximum of 0.5 % on the requirement of materials (**Plates, Sections and Pipes**) is admitted towards **process allowance and invisible wastage**.

Scrap quantity is permissible up to a **maximum of 1% on Structural (Beams, Channels, Angles, Rods, Pipes etc.), 2% on Sheets, 3% for Plates** on the theoretical requirement of materials.

If wastage and scrap is beyond the above limits, it should be fully justified with cutting diagrams etc. which are to be approved in advance by BHEL. **Otherwise, the cost of raw materials beyond approved limits will be recovered from the contractor as per BHEL recovery rates including applicable taxes & duties.**

Material reconciliation including return of balance materials, off-cuts is to be completed within 20 days from the date of completion of the order. The material reconciliation statement shall be submitted by the contractor after verification and certification by BHEL-HPVP along with the final bill **within 30 days from the date of completion of work**. Otherwise, recovery for the balance materials shall be made from any of their pending bills without further intimation,

Repeated occurrence of inordinate delays in returning and settling the material accounting will entail BHEL the right to terminate the contract forthwith or impose a temporary suspension on further loading at the discretion of BHEL.

12. SCRAP & OFF-CUT NORMS:

Sl. No.	Description	Scrap Size (in mm)	Off-Cut (in MM)
1.	CS/AS Sheets & Plates	Below 500 × 250	500 × 250 & above
2.	Rolled sections Rod, angles etc. (other than -tubes, pipes)	Below 1000	1000 & above
3.	Tubes & Pipes	Below 500	500 & above
4.	Universal column	Below 1000	1000 & Above
5.	SS Sheets & Plates	Below 500 × 250	500 × 250 & above
6.	SS Structural, Rods, Tubes, Pipes	Below 250	250 & above
7.	Non – ferrous: sheets & plates, rods & tubes	Below 500 × 250 (S & PL), Below 250 (Rods & Tubes)	500 × 250 & above, 250 & above
8.	Big size Scrap	(2500 & above) × (150 to 249)	-

13. INSPECTION:

Party shall contact our Quality Control Dept. for stages of inspection before commencement of job and should strictly follow the stages of inspection as per QAP.

14. WORKMANSHIP GUARANTEE:

The vendors should give workmanship guarantee for fabricated items for a period of 18 months from the date of last delivery of the order. Any defects due to incomplete work, faulty workmanship found in the fabricated items after delivery during the defects liability period shall be rectified / replaced by the vendor free of cost. Otherwise, the expenditure incurred towards the same will be recovered from the pending bills of vendors.

15. WORK PROGRESS:

The fabricator shall furnish a weekly report on the progress of work along with the status of availability of free issue materials and requirement of further materials, if any.

Outsourcing dept. personnel will visit vendor's works from time to time to assess and review the work progress. Free access shall be provided to BHEL or its inspection agency at all reasonable times of the day / night.

In case the progress is not satisfactory or supplies are delayed abnormally beyond the contractual delivery date, BHEL-HPVP, Visakhapatnam reserves the right to cancel the order in part or full or get the balance job in as is where is condition completed elsewhere by another agency at the risk and cost of Fabricator. The value of the work carried out by the party will be assessed by BHEL and the same shall be final. No compensation will be given to the fabricator in case of cancellation of order or diversion of balance job even if the jobs have been processed partly.

16. DELIVERY:

Finished items should be handed over to BHEL-HPVP on party's delivery challans along with Job completion certificate/ Final Inspection Report from inspection agency / HPVP-QC department.

17. PENALTY:

Penalty calculations will be done on DU wise (Dispatchable Unit) delivery. If delivery exceeds the stipulated delivery schedule, penalty @ 1/2 % of the value of each DU per week (or) part thereof subject to a maximum of 10% of the value of each DU will be levied. However, time taken for the following will not be considered as delay on the part of the Sub-Contractor.

- 1) Intermediate operations, if any, carried out by BHEL.
- 2) Waiting time for BHEL / Third party Inspection beyond a normal time of 3 days.

18. PAYMENT TERMS:

Payment shall be made against RA Bills within 45 days for MSE (Micro & Small Enterprise), 60 days for Medium Enterprise and 90 days for non-MSEs from the date of submission of Bill.

90% payment will be made after handing over of the finished equipments along with all inspection documents to HPVP shops / Logistics dept. / ADM site / Lova Garden site, whichever is applicable, duly inspected & cleared by Inspection authority. Balance 10% payment shall be made along with the Final Bill against completion of total order in all respects including documentation. All payments will be released only through RTGS / NEFT only.

Vendors shall have to submit the bills in the formats specified by HPVP-Outsourcing and the bills submitted in the specified format along with necessary supporting documents are only admitted for processing. The following documents shall be submitted along with the Final Bill:

1. No Claim Certificate from the contractor
2. No Dues Certificate from BHEL
3. Work Completion Certificate from BHEL
4. Material Reconciliation Statement submitted by the Contractor and certified by concerned authority of BHEL (if applicable)
5. Workmanship Guarantee certificate from the contractor

19. SECRECY:

All the documents of BHEL inclusive of Drawings, GMS and Standards made available to the fabricator should be kept in strict confidence and under no circumstance be made available to others or allow others to make use of them. Such documents shall be returned to BHEL on demand after completion of the job. This secrecy clause is binding on the employees of the fabricators also. Violation of the same may lead to suspension of business with the vendor and necessary legal action.

20. SUB-LETTING:

In general, sub-letting of jobs will not be permitted. But in special circumstances, this may be allowed. In such case, the party should obtain written approval from BHEL-HPVP, Visakhapatnam before sub-letting.

21. FACTORY RULES AND REGULATIONS:

Party shall abide by all the rules and statutory regulations in force from time to time as per factories act. It shall be party's responsibility to ensure the safety of their workmen and fulfilling the ESI, PF and other relevant statutory regulations.

22. SAFETY:

- a) Contractor shall adhere to safe construction practices, guard against hazardous & unsafe working conditions and shall comply with the safety rules of BHEL and local authorities. He shall maintain First Aid facilities for all his employees and labour. Contractor's responsibility includes supply of welder kit, all safety items such as safety belts, white and colour glasses, goggles, safety helmets, safety shoes etc.
- b) Contractor and his employees shall follow all fire & safety, security regulations of BHEL.

23. HOUSE KEEPING:

During execution of work, the contractor at all times keep the working place and storage area clean and free from accumulation of waste materials, rubbish etc.,

24. ACCIDENT / DAMAGE / CONDUCT ETC.:

Contractor will be held responsible for any disorderly conduct / misconduct, indiscipline, theft, smoking etc., on the part of his men. He will ensure summarily eviction of such men from his premises failing which BHEL would remove them from the factory on his responsibility. Any damage to and or loss of equipment, machinery, building etc., to BHEL or BHEL employees, visitors or other contractors resulting from his own or any of his men's negligence shall be liable to be made good by him. Contractor shall be solely responsible for any accident in which you or your men or your equipment may be involved during the execution of contract on account of any reason what so ever.

25. TERMINATION OF CONTRACT:

In the event of any failure on the part of the contractor, BHEL reserves the right to terminate the contract by giving a notice of 2 weeks for any of the following lapses and contractual violations: -

- a) Failure to make labour payments in time as per the rules
- b) Failure to progress the job according to the agreed schedule
- c) Failure to mobilize adequate man power, tools & tackles and consumables in time
- d) Failure to adhere to Quality Standards of BHEL
- e) Refused to co-operate with other agencies working in the same area
- f) Failure to resolve labour disputes like strikes etc., within 7 days of occurrence
- g) Failure to comply with statutory regulations applicable at BHEL

BHEL shall also be free to intervene and take necessary remedial measures. All costs incurred with interest and overheads shall be recovered from contractor by such foreclosing or off-loading any part of the contract work.

26. CONFLICT OF INTEREST AMONG BIDDERS / AGENTS:

A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices to the detriment of Procuring Entity's interests. ***The bidder found to have a conflict of interest shall be disqualified.*** A bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if:

- a) they have controlling partner (s) in common; **or**
- b) they receive or have received any direct or indirect subsidy / financial stake from any of them; **or**
- c) they have the same legal representative / agent for purposes of this bid; **or**
- d) they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder; **or**
- e) Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from one bidding manufacturer in more than one bid; **or**
- f) In cases of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorise only one agent / dealer. There can be only one bid from the following:
 1. The principal manufacturer directly or through one Indian agent on his behalf, and
 2. Indian/foreign agent on behalf of only one principal,
- g) A Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid, **or**
- h) In case of a holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sisters' common business/ management units in same/ similar line of business"

27. TAXES & DUTIES:

- a) BOCW Cess if applicable is to be paid by Contractor.
- b) In addition to existing taxes, any new taxes, cess, duties, levies imposed by Central/ State Govt. shall be borne by the contractor.
- b) In case, any new tax is imposed instead of existing tax, difference of the amount shall be reimbursed/ recovered on submission of documentary evidence.
- c) Any new tax is imposed by Central/ State Govt. (or) there is any variation in taxes after expiry of delivery / contract period, the same shall be borne by contractor only.
- d) All terms & conditions of the contract in respect of taxes & duties are subject to new taxation laws introduced from time to time by Govt. and Terms & conditions will deemed to be modified in accordance with the provisions of New Laws.

28. CONTRACTOR's MATERIAL:

Security of Contractor's Equipment, Tools & Tackles, Machinery etc., is in the scope of Contractor. BHEL is not responsible for the same.

29. RETURNING OF BHEL MATERIAL:

All Materials, machinery, equipment etc., of BHEL sent to site from BHEL-HPVP for execution of the Order are to be returned back to BHEL by the Contractor.

30. OVER RUN COMPENSATION (ORC) / IDLE CHARGES:

The contractor shall not be entitled to claim and the company shall not be liable to pay any amount on account of overrun compensation and idle charges, the overrun/ idling may be for whatsoever reasons.

31. DISPUTES:

Head of BHEL- HPVP Unit will be the final authority for any disputes arising out of this contract. The disputes / arbitration / settlement of contractual or legal issues shall be under the Jurisdiction of Visakhapatnam Court.

32. For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 15.06.2017 & 28.05.2018 and subsequent Orders issued by the respective Nodal Ministry shall be applicable even if issued after issue of this NIT but before finalization of Contract / PO / WO against this NIT.

In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and / or local content in respect of this procurement, same shall be applicable.

33. The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/ guidelines.

34. GRIEVANCE REDRESSAL MECHANISM:

To promote transparency and ensure fair treatment of all bidders, a structured Grievance Redressal Mechanism is in place to address any concerns or issues arising during the tendering process or in subsequent business dealings with the company.

Suppliers/Contractors are requested to follow the below escalation process for grievance resolution:

1. **First Level:** Any grievance should initially be addressed to the designated Dealing Officer, whose contact details are provided in the Notice Inviting Tender (NIT) / Contract.
2. **Second Level:** If the issue remains unresolved, it may be escalated by lodging a formal grievance through the SUVIDHA Portal: <https://suvidha.bhel.in/suvidha/>. Responses will be provided in accordance with the defined escalation matrix."

35. NO INTEREST PAYABLE TO CONTRACTOR

Notwithstanding anything to the contrary contained in any other document comprising in the Contract, no interest shall be payable by BHEL to Contractor on any moneys or balances including but not limited to the Security Deposit, EMD, Retention Money, RA Bills or the Final Bill, or any amount withheld and/or appropriated by BHEL. etc., which becomes or as the case may be, is adjudged to be due from BHEL to Contractor whether under the Contract or otherwise.

36. LIMITATION ON LIABILITY:

Notwithstanding anything to the contrary in this Contract or any other mutually agreed document between the parties, the maximum liability, for damages, of the Contractor, its servants or agents, shall under no circumstances exceed an amount equal to the Contract Value.

Neither party shall be liable to the other for any indirect or consequential loss or damage, including but not limited to loss of use, loss of profits, or loss of contracts, or special, punitive, exemplary losses whatsoever, arising out of or in connection with this Contract.

This shall not be applicable on the recoveries made by Customer from BHEL on account of Contractor, any other type of recoveries for workmanship, material, T&P etc. due from the Contractor.

37. CARTEL FORMATION:

The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/ guidelines.

38. FRAUD PREVENTION POLICY:

Bidder along with its associate /collaborators /sub-contractors /sub-vendors / consultants / service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.

39. FORCE MAJEURE

- 1) "Force Majeure" shall mean circumstance which is:
 - a) beyond control of either of the parties to contract,
 - b) either of the parties could not reasonably have provided against the event before entering into the contract,
 - c) having arisen, either of the parties could not reasonably have avoided or overcome, and
 - d) is not substantially attributable to either of the parties And Prevents the performance of the contract,Such circumstances include but shall not be limited to:
 - i) War, hostilities, invasion, act of foreign enemies.
 - ii) Rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war.
 - iii) Riot, commotion or disorder by persons other than the contractor's personnel and other employees of the contractor and sub-contractors.
 - iv) Strike or lockout not solely involving the contractor's personnel and other employees of the contractor and sub-contractors.
 - v) Encountering munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the contractor's use of such munitions, explosives, radiation or radio-activity.
 - vi) Natural catastrophes such as earthquake, tsunami, volcanic activity, hurricane or typhoon, flood, fire, cyclones etc.
 - vii) Epidemic, pandemic etc.
- 2) The following events are explicitly excluded from Force Majeure and are solely the responsibilities of the non-performing party: a) any strike, work-to-rule action, go-slow or similar labour difficulty (b) late delivery of equipment or material (unless caused by Force Majeure event) and (c) economic hardship.
- 3) If either party is prevented, hindered or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances thereof within 15 (fifteen) days after the occurrence of such event.
- 4) The party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such party's performance is prevented, hindered or delayed. The Time for Completion shall be extended by a period of time equal to period of delay caused due to such Force Majeure event.
- 5) Delay or non-performance by either party hereto caused by the occurrence of any event of Force Majeure shall not
 - a) Constitute a default or breach of the Contract.
 - b) Give rise to any claim for damages or additional cost expense occasioned thereby, if and to the extent that such delay or non-performance is caused by the occurrence of an event of Force Majeure.
- 6) BHEL at its discretion may consider short closure of contract after 1 year of imposition of Force Majeure in line with extant guidelines. In any case, Supplier/Vendor cannot consider deemed short-closure after 1 year of imposition of Force Majeure.

40. In respect of procurement of goods or services from Micro, Small and Medium enterprises (MSMEs), the settlement of invoice shall be only through any of the TReDS platform (i.e RXIL, M1xchange, Invoicemart, KReDX, C2FO), authorised by the Reserve Bank of India. Such MSME suppliers to select their preferred TReDS platform before award of contract so that the data is captured in the Order/Contract database of the Unit. They also will have the option to change the TReDS platform from the drop down menu on Suvidha portal of BHEL, at the time of invoice submission.

Wherever the Trade Receivable is accepted by BHEL, the same shall be validated by the Unit on the respective TReDS platform selected by the supplier.

The routing of invoices through the TReDS platforms shall not be construed as mandating discounting of such invoices and the MSMEs supplier shall have the option to avail or not avail financing or discounting of its receivables on the TReDS platform.

In case discounting is not availed by the supplier on TReDS, **the trade receivables will be paid through TReDS as per the payment timelines indicated in the contract.**

41. ORDER ACCEPTANCE:

If the order acceptance is not received within 03 days from the date of release of Sub-contract order, it shall be assumed that the same has been accepted by you thereof.

Signature of the Bidder with stamp

Acceptance to Tender Terms & Conditions

I / We hereby confirm that the Tender documents, Drawings, Quality documents etc. have been studied in detail and we have fully understood the scope of work.

I / We accept to all the Terms and Conditions of the Tender Enquiry without any deviations and the prices quoted are in accordance with the same.

I / We give our acceptance to participate in reverse auction for this tender.

Tender documents duly signed on all the pages by the Owner / authorized representative of the bidder are attached herewith.

Signature of the bidder with Stamp

BUSINESS RULES FOR REVERSE AUCTION (RA)

This has reference to tender no. **OS/26-27/8194/Coils/16/016, dated 16.07.2026**. BHEL shall finalise the Rates for **Fabrication of Super Heater & Economizer Coils against S.O. No. 8194 at Vendor works with free issue materials** through Reverse Auction mode. BHEL has made arrangement with an authorized Service provider (details will be shared before reverse auction) for conducting RA. Bidders should go through the instructions given below and submit acceptance of the same.

The technical & commercial terms are as per (a) BHEL Tender Enquiry No. **OS/26-27/8194/Coils/16/016, dated 16.07.2026**, (b) Bidders' technical & commercial bid (in case of two-part bid) and (c) subsequent correspondences between BHEL and the bidders, if any.

1. Procedure of Reverse Auctioning:

- i) Price bids of all techno-commercially qualified bidders shall be opened.
- ii) **Reverse Auction:** The 'bid decrement' will be decided by BHEL.
- iii) The lowest bidder in sealed envelope price bid shall be shown as current L1 automatically by the system and no acceptance of that price is required. System shall have the provision to indicate this bid as current L1.
- iv) Bidders by offering a minimum bid decrement or the multiples thereof can displace a standing lowest bid and become "L1" and this continues as an iterative process. However, no bidder shall be allowed to lower its bid below the current L1 by more than 5 decrements at one go.
- v) After the completion of the reverse auction, the Closing Price shall be available for further processing.
- vi) Wherever the evaluation is done on total cost basis, after Reverse Auction, prices of individual line items shall be reduced on pro-rata basis.

2. Schedule for reverse auction: The Reverse Auction schedule will be intimated to the techno-commercially qualified bidders at a later stage.

3. Auction extension time: If a bidder places a bid in the last {...} minutes of closing of the Reverse Auction and if that bid gets accepted, then the auction's duration shall get extended automatically for another {...} minutes, for the entire auction (i.e. for all the items in the auction), from the time that bid comes in. Please note that the auto-extension will take place only if a bid comes in those last {...} minutes and if that bid gets accepted as the lowest bid. If the bid does not get accepted as the lowest bid, the auto-extension will not take place even if that bid might have come in the last {...} minutes. In case, there is no bid in the last {...} minutes of closing of Reverse Auction, the auction shall get closed automatically without any extension. However, bidders are advised not to wait till the last minute or last few seconds to enter their bid during the auto-extension period to avoid complications related with internet connectivity, network problems, system crash down, power failure, etc. The above process will continue till completion of Reverse Auction. Complaints/ Grievances, if any, regarding denial of service or any related issue should be given in writing thru e-mail/ fax to M/s. {Service provider} with a copy to BHEL within 15 minutes prior to initial closing time of Reverse Auction.

4. Bid price: The Bidder has to quote the {...} Price inclusive of Packing & Forwarding charges, all the routine & type tests as per tender scope, taxes, duties, freight and insurance as specified in tender document including loading (if indicated by BHEL due to deviations in technical/ commercial terms) for the Items specified. Details are as shown in Excel Sheet for calculation of total cost to BHEL (To be specified by Unit as per NIT conditions).

5. Bidding currency and unit of measurement: Bidding will be conducted in *Indian Rupees per Unit* of the material as per the specifications mentioned in the tender. In case of foreign currency bids, exchange rate (TT selling rate of State Bank of India) as on scheduled date of tender opening (Part-I bid) shall be considered for conversion in Indian Rupees. If the relevant day happens to be a Bank holiday, then the forex rate as on the previous bank (SBI) working day shall be taken.

6. **Validity of bids:** Price shall be valid for 90 days from the date of reverse auction. These shall not be subjected to any change whatsoever.
7. **Lowest bid of a bidder:** In case the bidder submits more than one bid, the lowest bid at the end of Reverse Auction will be considered as the bidder's final offer to execute the work.
8. Unique user IDs shall be used by bidders during bidding process. All bids made from the Login ID given to the bidders will be deemed to have been made by the bidders/ bidders' company.
9. **Post auction procedure:** BHEL will proceed with the Lowest Bid in the Reverse Auction for further processing.
10. Any commercial/ technical loading shall be separately intimated to respective bidders prior to RA. The excel sheet provided in this regard shall cover all these aspects. Commercial/ technical loading if any, shall be added by the respective bidder in its price during Reverse Auction. Modalities of loading & de-loading shall be separately intimated to the bidders. The responsibility for correctness of total cost to BHEL shall lie with the bidders.
11. Reverse auction shall be conducted by BHEL (through M/s {Service Provider}), on pre-specified date, while the bidders shall be quoting from their own offices/ place of their choice. Internet connectivity shall have to be ensured by bidders themselves.

During the RA process if a bidder is not able to bid and requests for extension of time by FAX/ email/ phone then time extension of additional 15 minutes will be given by the service provider provided such requests come before 5 minutes of auction closing time. However, only one such request per bidder can be entertained.

In order to ward-off contingent situation of connectivity failure bidders are requested to make all the necessary arrangements/ alternatives whatever required so that they are able to circumvent such situation and still be able to participate in the reverse auction successfully. Failure of power or loss of connectivity at the premises of bidders during the Reverse auction cannot be the cause for not participating in the reverse auction. On account of this, the time for the auction cannot be extended and neither BHEL nor M/s. {Service provider} is responsible for such eventualities.

12. **Proxy bids:** Proxy bidding feature is a pro-bidder feature to safe guard the bidder's interest of any internet failure or to avoid last minute rush. The proxy feature allows bidders to place an automated bid in the system directly in an auction and bid without having to enter a new amount each time a competing bidder submits a new offer. The bid amount that a bidder enters is the minimum that the bidder is willing to offer. Here the software bids on behalf of the bidder. This obviates the need for the bidder participating in the bidding process until the proxy bid amount is decrementally reached by other bidders. When proxy bid amount is reached, the bidder (who has submitted the proxy bid) has an option to start participating in the bidding process.

The proxy amount is the minimum amount that the bidder is willing to offer. During the course of bidding, the bidder cannot delete or change the amount of a proxy bid.

Bids are submitted in decrements (decreasing bid amounts). The application automates proxy bidding by processing proxy bids automatically, according to the decrement that the auction originator originally established when creating the auction, submitting offers to the next bid decrement each time a competing bidder bids, regardless of the fact whether the competing bids are submitted as proxy or standard bids. However, it may please be noted that if a manual bid and proxy bid are submitted at the same instant manual bid will be recognized as the L1 at that instant.

In case of more than one proxy bid, the system shall bid till it crosses the threshold value of 'each lowest proxy bid' and thereafter allow the competition to decide the final L1 price.

Proxy bids are fed into the system directly by the respective bidders. As such this information is privy only to the respective bidder(s).

13. Bidders are advised to get fully trained and clear all their doubts such as refreshing of Screen, quantity being auctioned, tender value being auctioned etc. from M/s. {Service provider}.

14. M/s. {Service provider}, shall arrange to demonstrate/ train the bidder or bidder's nominated person(s), without any cost to bidders. M/s. {Service provider}, shall also explain the bidders, all the business rules related to the Reverse Auction. Bidders are required to submit their acceptance to the terms/ conditions/ modalities before participating in the Reverse Auction in the process compliance form as enclosed. Without this, the bidder will not be eligible to participate in the event.
15. Successful bidder shall be required to submit the final prices (L1) in prescribed format (Annexure – VI) for price breakup, quoted during the Reverse Auction, duly signed and stamped as token of acceptance without any new condition (other than those already agreed to before start of auction), after the completion of auction to M/s. {Service provider} besides BHEL within two working days of Auction without fail.
16. Any variation between the final bid value and that in the confirmatory signed price breakup document will be considered as tampering the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings (as available on www.bhel.com).
17. Bidders' bid will be taken as an offer to execute the work/ supplies the item as per enquiry no. **OS/26-27/8194/Coils/16/016, dated 16.07.2026**. Bids once made by the bidder, cannot be cancelled/ withdrawn and bidder shall be bound to execute the work as mentioned above at bidder's final bid price. Should bidder back out and not execute the contract as per the rates quoted, BHEL shall take action as per extant guidelines for suspension of business dealings (as available on www.bhel.com).
18. Bidders shall be able to view the following on their screen along with the necessary fields during Reverse Auction:
 - a. Leading (Running Lowest) Bid in the Auction (only total price of package)
 - b. Bid Placed by the bidder
 - c. Start Price
 - d. Decrement value
 - e. Rank of their own bid during bidding as well as at the close of auction.
19. BHEL's decision on award of contract shall be final and binding on all the Bidders.
20. BHEL reserves the right to extend, reschedule or cancel the Reverse Auction process at any time, before ordering, without assigning any reason, with intimation to bidders.
21. BHEL shall not have any liability to bidders for any interruption or delay in access to the site irrespective of the cause. In such cases, the decision of BHEL shall be binding on the bidders.
22. Other terms and conditions shall be as per bidder's techno-commercial offers and other correspondences, if any, till date.
23. If there is any clash between this business document and the FAQ available, if any, in the website of M/s. {Service provider}, the terms & conditions given in this business document will supersede the information contained in the FAQs. Any changes made by BHEL/ service provider (due to unforeseen contingencies) after the first posting shall be deemed to have been accepted if the bidder continues to access the portal after that time.
24. Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines for suspension of business dealings (as available on www.bhel.com)*, shall be initiated by BHEL.

Signature of the Bidder with Stamp

GST COMPLIANCE FOR INDIGENOUS SUPPLIERS

1. In Response to Tenders for Indigenous supplier will be entertained only if the vendor has a valid GSTIN which should be clearly mentioned in the offer. If any specific exemption is available, a declaration with due supporting documents need to be furnished for considering the offer.
2. Supplier shall mention their GSTIN in all their invoices and invoices shall be in the format as specified/prescribed under GST laws. Invoices shall necessarily contain Invoice number (in case of multiple numbering system is being followed for billing like SAP invoice no, commercial invoice no etc., then the Invoice No which is linked/uploaded in GSTN network shall be clearly indicated), item description as per PO, Quantity, Rate, Value, applicable taxes with nomenclature (like IGST, SGST, CGST & UTGST) separately, HSN/ SAC Code, etc.
3. All invoices shall bear the HSN Code for each item separately (Harmonized System of Nomenclature)/ SAC code (Services Accounting Code).
4. A declaration to the effect that all invoice particulars are/were uploaded in the GSTN network/ portal & all tax liability as per GST rules and regulations have been and will be discharged, shall be mentioned in the invoice. If not mentioned in the invoice, a separate declaration shall be submitted as per the requirement of BHEL.
5. All documents like Test Certificate, LR copy, Guarantee/Warrantee certificate, work completion certificate, any other document mentioned in PO, shall be sent along with the vehicle/consignment where ever applicable. For all consignments received within the calendar month, input credit will be availed within that month in line with monthly returns filing cycle. In case of any discrepancy in the document or non-submission of documents mentioned in the PO, then BHEL will not be able to accept or account the material, in such case availing of tax credit will be deferred to next month or so.
6. In case of discrepancy in the data uploaded by supplier in the GSTN portal or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note (details to be uploaded in GSTN portal) for the shortages or rejections in the suppliers, within the calendar month notified by BHEL.
7. For any such delay in availing of tax credit for reasons attributable to supplier (as mentioned above), interest (calculated @ SBI Base Rate + 6%) along with penalty if any will be deducted for the delayed period i.e. from the month of receipt till the month tax credit is availed, from the running bills.
8. Under GST regime, BHEL has to discharge GST liability on LD recovered from suppliers/contractors. Hence applicable GST shall also be recoverable from suppliers/contractors on LD amount. For this Debit note will be issued by BHEL indicating the respective supply invoice number.
9. This is to inform that GST portion of invoice, shall be released only upon Vendor declaring such invoice in his GSTR-1 and receipt of goods and Tax invoice by BHEL and Confirmation of payment of GST thereon by vendor on GSTN portal. Alternatively, BG of appropriate value may be obtained from vendor which shall be valid At least one month after the confirmation of date of payment of GST by vendor on GSTN portal and receipt of Tax invoice and receipt of goods, whichever is later. Above is subject to receipt of goods/service and tax invoice thereof along with vendor declaring invoice in his return and paying GST within timeline prescribed for availing ITC by BHEL.
10. That in case vendor delays Declaring such invoice in his return and GST credit availed by BHEL is denied or reversed subsequently as per GST law, GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from vendor/contractor along with interest levied/ leviable on BHEL.

Note: The above will be followed strictly for processing vendor payments to ensure GST Compliance.

Signature of the Bidder with Stamp

INTEGRITY PACT**Between**

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____

_____ (hereinafter referred to as "Contract"). The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint panel of Independent External Monitor(s) (IEMs), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

- 1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles: -
 - 1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
 - 1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.
 - 1.1.3 The Principal will exclude from the process all known prejudiced persons.
- 1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Bharatiya Nyaya Sanhita (BNS) 2023 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

- 2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. The Bidder(s)/ Contractor(s) commits himself to observe the following principles during participation in the tender process and during the contract execution.

- 2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
- 2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
- 2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Bharatiya Nyaya Sanhita (BNS) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
- 2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.
- 2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.
- 2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and shall await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process, terminate the contract, if already awarded, exclude from future business dealings and/ or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 4 - Compensation for Damages

- 4.1 If the Principal has disqualified the Bidder (s) from the tender process before award / order acceptance according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.
- 4.2 If the Principal is entitled to terminate the Contract according to Section 3, or terminates the Contract in application of Section 3 above, the Bidder(s)/ Contractor (s) transgression through a violation of Section 2 above shall be construed breach of contract and the Principal shall be entitled to demand and recover from the Contractor an amount equal to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher, as damages, in addition to and without prejudice to its right to demand and recover compensation for any other loss or damages specified elsewhere in the contract.

Section 5 - Previous Transgression

- 5.1 The Bidder declares that no previous transgressions occurred in the last 3 (three) years (to be reckoned from date of bid submission) with any other company in any country conforming to the anti-corruption approach in India that could justify his exclusion from the tender process. The date of such transgression, for the purpose of disclosure by the bidders in this regard, would be the date on which cognizance of the said transgression was taken by the competent authority. The transgression(s), for which cognizance was taken even before the said period of three years, but are pending conclusion, shall also be reported by the bidders.
- 5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason or action can be taken as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 6 - Equal treatment of all Bidder (s)/ Contractor (s) / Sub-contractor (s)

- 6.1 The Principal will enter into Integrity Pacts with identical conditions as this Integrity Pact with all Bidders and Contractors.
- 6.2 In case of a joint venture, all the partners of the joint venture should sign the Integrity Pact. In case of Sub-contracting, the Principal Contractor shall be solely responsible for the adherence to the provisions of IP by the sub-contractor(s).
- 6.3 The Principal will disqualify from the tender process all Bidders who do not sign this Integrity Pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 -Independent External Monitor(s)

- 8.1 The Principal appoints competent and credible panel of Independent External Monitor (s) (IEMs) for this Integrity Pact. The task of the IEMs is to review independently and objectively, whether and to what extent the parties comply with the obligations under this Integrity Pact on receipt of any complaint by them from the bidder(s).
- 8.2 The IEMs are not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.
- 8.3 The IEMs shall be provided access to all documents/ records pertaining to the Contract, for which a complaint or issue is raised before them as and when warranted. However, the documents/records/information having National Security implications and those documents which have been classified as /Top Secret are not to be disclosed.
- 8.4 The Principal will provide to the IEMs sufficient information about all meetings among the parties related to the Contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the IEMs the option to participate in such meetings.
- 8.5 The role of IEM is advisory and the advice of IEM is non- binding on the Organization. However, as IEMs are invariably persons with rich experience who have retired as senior functionaries of the government, their advice would help in proper implementation of the IP.

- 8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of the tendering process, the matter should be examined by the full panel of IEMs jointly, who would look into the records, conduct an examination, and submit their joint recommendations to the Management. In case the full panel is not available due to some unavoidable reasons, the available IEM(s) will conduct examination of the complaints. Consent of the IEM(s), who may not be available, shall be taken on record.
- 8.7 The IEMs shall examine all the representations/grievances/ complaints received by them from the bidders or their authorized representative related to any discrimination on account of lack of fair play in modes of procurement and bidding systems, tendering method, eligibility conditions, bid evaluation criteria, commercial terms & conditions, choice of technology/ specifications etc.
- 8.8 The CMD, BHEL shall decide the compensation to be paid to the IEMs and its terms and conditions.
- 8.9 IEMs should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the Principal should be looked into by the CVO of the Principal.
- 8.10 If the IEMs have reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Bharatiya Nyaya Sanhita (BNS)/ Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the IEMs may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
- 8.11 After award of work, the IEMs shall look into any issue relating to execution of Contract, if specifically raised before them. As an illustrative example, if a Contractor who has been awarded the Contract, during the execution of Contract, raises issue of delayed payment etc. before the IEMs, the same shall be examined by the panel of IEMs.
- 8.12 However, the IEMs may suggest systemic improvements to the management of the Principal, if considered necessary, to bring about transparency, equity and fairness in the system of procurement.
- 8.13 The word 'Monitor' would include both singular and plural.

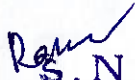
Section 9 - Pact Duration

- 9.1 This Integrity Pact shall be operative from the date this Integrity Pact is signed by both the parties. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings.
- 9.2 If any claim is made/ lodged during currency of this Integrity Pact, the same shall be binding and continue to be valid despite the lapse of this Pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

- 10.1 This Integrity Pact is subject to Indian Laws and exclusive jurisdiction shall be of the competent Courts as indicated in the Tender or Contract, as the case may be.
- 10.2 Changes and supplements as well as termination notices need to be made in writing.

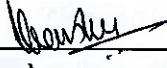
- 10.3 If the Bidder(s)/ Contractor(s) is a partnership or a consortium or a joint venture, this Integrity Pact shall be signed by all partners of the partnership or joint venture or all consortium members.
- 10.4 Should one or several provisions of this Integrity Pact turn out to be invalid, the remainder of this Integrity Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 10.5 Only those bidders / contractors who have entered into this Integrity Pact with the Principal would be competent to participate in the bidding. In other words, entering into this Integrity Pact would be a preliminary qualification.
- 10.6 In the event of any dispute between the Principal and Bidder(s)/ Contractor(s) relating to the Contract, in case, both the parties are agreeable, they may try to settle dispute through Mediation before the panel of IEMs in a time bound manner. If required, the Principal may adopt any mediation rules for this purpose. However, not more than five meetings shall be held for a particular dispute resolution. The fees/expenses on dispute resolution shall be equally shared by both the parties. In case, the dispute remains unresolved even after mediation by the panel of IEMs, either party may take further action as the terms & conditions of the Contract.


S.N.V.S RAMESH
DGM (COMMERCIAL & OUT SOURCING)
BHARAT HEAVY ELECTRICAL LIMITED (BHEL)
HEAVY PLATES & VESSELS PLANT (HPVP)
VISAKHAPATNAM-530 012
For & On behalf of the Principal
(Office Seal)

For & On behalf of the Bidder/ Contractor
(Office Seal)

Place _____

Date _____

Witness: 
(Name & Address) _____

D. N. MURTHY
Manager (OS)
Bharat Heavy Electricals Ltd
HPVP Visakhapatnam-530 012

Witness: _____
(Name & Address) _____



BHARAT HEAVY ELECTRICALS LIMITED
UNIT- HEAVY PLATES & VESSELS PLANT
VISAKHAPATNAM – 530 012
(A Govt. of India Enterprise)

MANDATE FORM

OPTION TO RECEIVE E-PAYMENT THROUGH NEFT & RTGS.

1. NAME : **BHARAT HEAVY ELECTRICALS LTD (HPVP)**
2. ADDRESS : **NATHAYYAPALE,**
VISAKHAPATNAM
3. PARTICULARS OF BANK ACCOUNT
 - a) BANK NAME : **STATE BANK OF INDIA**
 - b) BRANCH NAME : **BHPV BRANCH**
 - c) BRANCH ADDRESS : **BHPV POST, VISAKHAPATNAM**
 - d) IFSC CODE : **SBIN0001675**
 - e) ACCOUNT NUMBER ; **33362109398**
 - f) E-MAIL ID FOR RECEIVING SYSTEM GENERATED PAYMENT ADVICE :
vivaan@bhel.in

I hereby further declare that particulars furnished above are correct.

FOR BHARAT HEAVY ELECTRICALS LIMITED

Vivany Mohanty
(Authorised Signatory)

[Signature]

Bank Certification

This is to certify that the particulars furnished at Point (3), above are correct and complete as per our records.

[Signature]
22/02/26
Seal & Signature of Authorised Bank Official

HACHIT KUMAR
Chief Manager
PF No: 442930 SS No: AD110
SBI BHPV Br- 01675

HPVP Unit, VISAKHAPATNAM – 530 012, A.P.,INDIA. Tel.No: +91(0891)2881280. Fax :+91(0891)2881700.
Registered Office : BHEL House, Siri Fort,NEW DELHI – 110049, India.
Website : <http://www.bhel.com>, Tel.Nos: (91)(11)66337000(Multiple lines),Fax: (91)(11)26493021(Gen.)



भारतीय स्टेट बैंक
State Bank Of India

(01675) - BHPV, VISAKHAPATNAM
B.H.P.V. TOWNSHIP CAMPUS, VISAKHAPATNAM DIST: VISAKHAPATNAM
ANDHRA PRADESH 530012
Tel: 891-2547477 IFS Code: SBIN0001675

ID/F

केवल 3 महीने के लिए वैध / VALID FOR 3 MONTHS ONLY

28042025
D D M M Y Y Y Y

FU4UyL

PAY

YOUR SERVICES

को या उनके आदेश पर OR ORDER

रुपये RUPEES ONE LAH FOURTY TWO THOUSAND SEVENT HUNDRED AND SIXTY FOUR
only -

अदा करें ₹ 1,42,864/-

खा. सं.
A/c No.

33362109398

VALID UPTO ₹ 50 LACS AT NON-HOME BRANCH FOR NON-CASH TRANSACTION ONLY

89390126333

CC ACCOUNT

PREFIX:
1515800003

R. Rana Viraan Aroha by

BHARAT HEAVY ELECTRICALS LTD BHEL HPVP-V

MULTI-CITY CHEQUE Payable at Par at All Branches of SBI

Please sign above

⑈413088⑈ 530002006⑈ 000096⑈ 30

Total			
-------	--	--	--

MTI

PROFORMA OF BANK GUARANTEE FOR EARNEST MONEY

(On non-Judicial paper of appropriate value)

Bank Guarantee No.....

Date.....

To

(Employer's Name and Address)

.....

Dear Sirs,

In accordance with the terms and conditions of Invitation for Bids/Notice Inviting Tender No.....(Tender Conditions), M/s. having its registered office at(hereinafter referred to as the 'Tenderer'), is submitting its bid for the work of.....invited by(name of the Employer) through its Unit at(The Tender Conditions provide that the Tenderer shall pay a sum of Rs as Earnest Money Deposit in the form therein mentioned. The form of payment of Earnest Money Deposit includes Bank Guarantee executed by a Scheduled Bank.

In lieu of the stipulations contained in the aforesaid Tender Conditions that an irrevocable and unconditional Bank Guarantee against Earnest Money Deposit for an amount of is required to be submitted by the Tenderer as a condition precedent for participation in the said Tender and the Tenderer having approached us for giving the said Guarantee,

we, the[Name & address of the Bank] having our Registered Office at(hereinafter referred to as the Bank) being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer without any demur, merely on your first demand any sum or sums of Rs.....(in words Rupees.....) without any reservation, protest, and recourse and without the beneficiary needing to prove or demonstrate reasons for its such demand.

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Vendor/Contractor/Vendors in any suit or proceeding pending before any Court or Tribunal, Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Tenderer shall have no claim against us for making such payment.

We Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Tender or to extend the time of submission of from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Tenderer and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Tenderer or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Tenderer or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Tenderer and notwithstanding any security or other guarantee that the Employer may have in relation to the Tenderer's liabilities.

This Guarantee shall be irrevocable and shall remain in force upto and including..... and shall be extended from time to time for such period as may be desired by the Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Tenderer but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms hereof. However, unless a demand or claim under this Guarantee is made on us in writing on or before the we shall be discharged from all liabilities under this Guarantee.

We, Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

This Bank Guarantee shall be governed, construed and interpreted in accordance with the laws of India.

Courts at shall alone have exclusive jurisdiction over any matter arising out of or in connection with this Bank Guarantee

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....
- b) This Guarantee shall be valid up to
- c) Unless the Bank is served a written claim or demand on or before _____ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of

(Name of the Bank)

Date.....

Place of Issue.....

¹ *Details of the Invitation to Bid/Notice Inviting Tender*

² *Name and Address of the Tenderer*

³ *Details of the Work*

⁴ *Name of the Employer*

⁵ *BG Amount in words and Figures*

⁶ *Validity Date*

⁷ *Date of Expiry of Claim Period*

Notes:

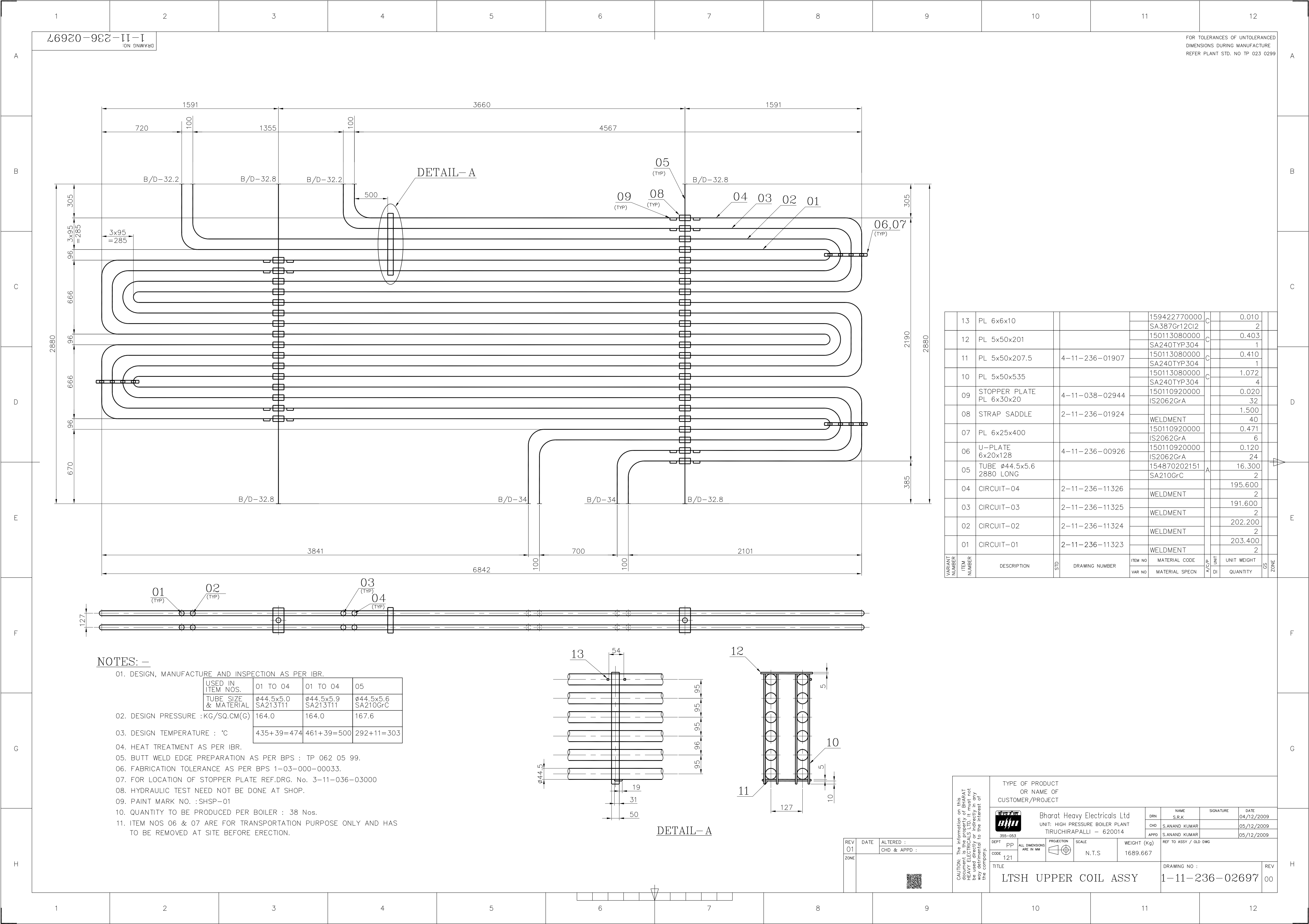
1. Units are advised that expiry of claim period may be kept 3-6 months after validity date. It may be ensured that the same is in line with the agreement/ contract entered with the Vendor.
2. The BG should be on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Contractor/sub-contractor /vendor/ Bank issuing the guarantee.
3. In line with the GCC, SCC or contractual terms, Unit may carry out minor modifications in the Standard BG Formats. If required, such modifications may be carried out after taking up appropriately with the Unit/Region's Law Deptt.

4. In Case of Bank Guarantees submitted by Foreign Vendors-**a. From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)**

can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)

- b.1** In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank's (BHEL's Consortium Bank) branch in India. It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
- b.2** In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.
- b.3** The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). The BG Format provided to them should clearly specify the same.



	13	PL 6x6x10				159422770000	C	0.010		
						SA387Gr12Cl2		2		
	12	PL 5x50x201				150113080000	C	0.403		
						SA240TYP304		1		
	11	PL 5x50x207.5	4-11-236-01907			150113080000	C	0.410		
						SA240TYP304		1		
	10	PL 5x50x535				150113080000	C	1.072		
						SA240TYP304		4		
	09	STOPPER PLATE PL 6x30x20	4-11-038-02944			150110920000		0.020		
						IS2062GrA		32		
	08	STRAP SADDLE	2-11-236-01924					1.500		
						WELDMENT		40		
	07	PL 6x25x400				150110920000		0.471		
						IS2062GrA		6		
	06	U-PLATE 6x20x128	4-11-236-00926			150110920000		0.120		
						IS2062GrA		24		
	05	TUBE Ø44.5x5.6 2880 LONG				154870202151	A	16.300		
						SA210GrC		2		
	04	CIRCUIT-04	2-11-236-11326					195.600		
						WELDMENT		2		
	03	CIRCUIT-03	2-11-236-11325					191.600		
						WELDMENT		2		
	02	CIRCUIT-02	2-11-236-11324					202.200		
						WELDMENT		2		
	01	CIRCUIT-01	2-11-236-11323					203.400		
						WELDMENT		2		
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO VAR NO	MATERIAL CODE MATERIAL SPECN	A/C/P DI	UNIT WEIGHT QUANTITY	CS ZONE	

NOTES: -

01. DESIGN, MANUFACTURE AND INSPECTION AS PER IBR.

USED IN ITEM NOS.	01 TO 04	01 TO 04	05
TUBE SIZE & MATERIAL	Ø44.5x5.0 SA213T11	Ø44.5x5.9 SA213T11	Ø44.5x5.6 SA210GrC
02. DESIGN PRESSURE : KG/SQ.CM(G)	164.0	164.0	167.6
03. DESIGN TEMPERATURE : °C	435+39=474	461+39=500	292+11=303

04. HEAT TREATMENT AS PER IBR.

05. BUTT WELD EDGE PREPARATION AS PER BPS : TP 062 05 99.

06. FABRICATION TOLERANCE AS PER BPS 1-03-000-00033.

07. FOR LOCATION OF STOPPER PLATE REF.DRG. No. 3-11-036-03000

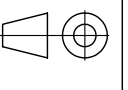
08. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.

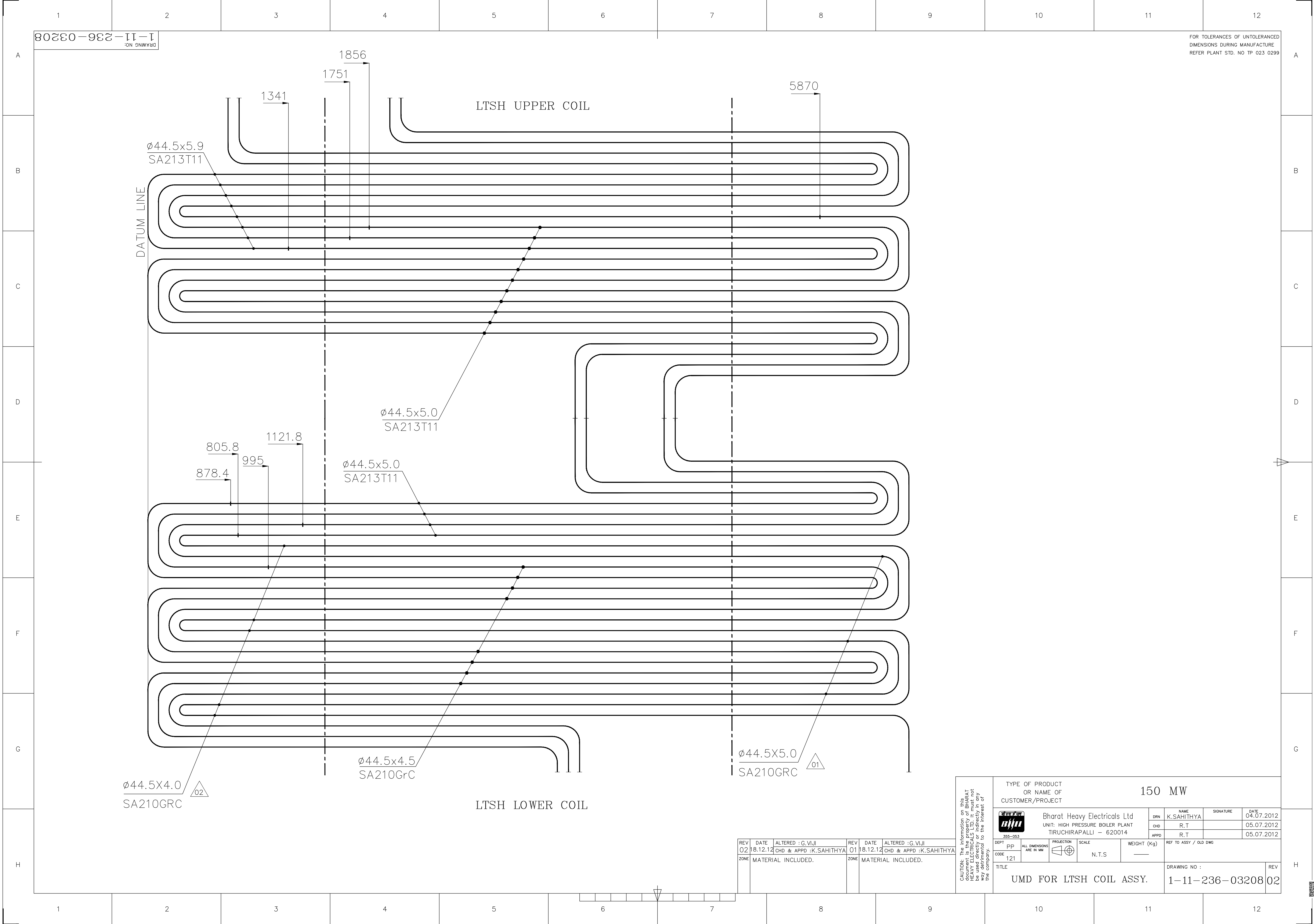
09. PAINT MARK NO. : SHSP-01

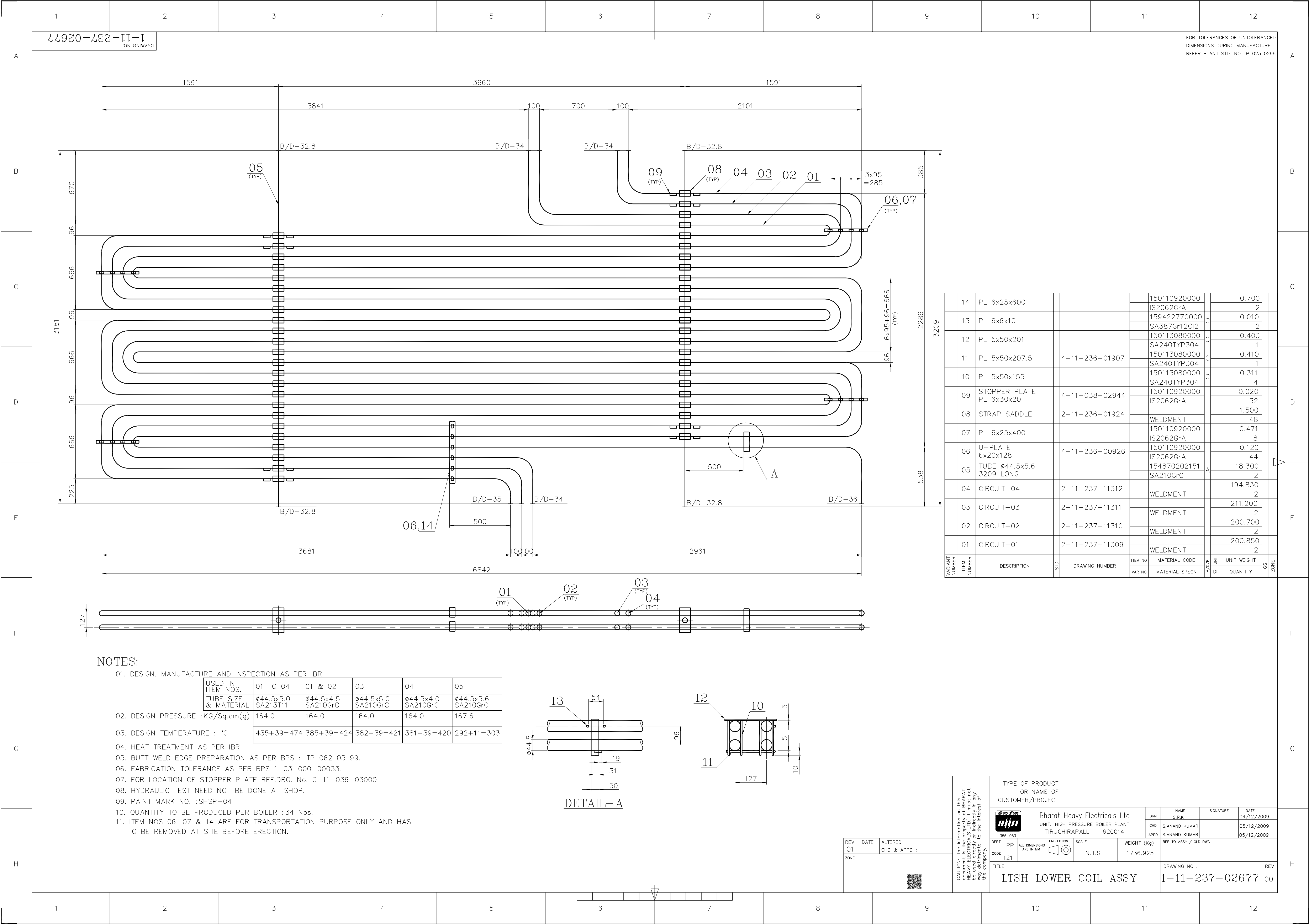
10. QUANTITY TO BE PRODUCED PER BOILER : 38 Nos.

11. ITEM NOS 06 & 07 ARE FOR TRANSPORTATION PURPOSE ONLY AND HAS TO BE REMOVED AT SITE BEFORE ERECTION.

DETAIL-A

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be reproduced or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of the company.	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT				
			Bharat Heavy Electricals Ltd		
	UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014		DRN S.R.K	SIGNATURE	
	355-053		CHD S.ANAND KUMAR	DATE 04/12/2009	
	APPD S.ANAND KUMAR		05/12/2009		
DEPT PP	ALL DIMENSIONS ARE IN MM	PROJECTION 	SCALE N.T.S	WEIGHT (Kg) 1689.667	REF TO ASSY / OLD DWG
CODE 121	DRAWING NO : 1-11-236-02697				REV 00
TITLE LTSH UPPER COIL ASSY					





TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT				DRN		NAME S.R.K		SIGNATURE		DATE	
355-053				CHD		S.ANAND KUMAR		05/12/2009		04/12/2009	
DEPT PP				APPD		S.ANAND KUMAR		05/12/2009			
CODE 121				ALL DIMENSIONS ARE IN MM		PROJECTION		SCALE		WEIGHT (Kg)	
TITLE				N.T.S				1736.925		REF TO ASSY / OLD DWG	
LTSH LOWER COIL ASSY				DRAWING NO :		1-11-237-02677		REV		00	

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO	MATERIAL CODE	A/C/P	UNIT	UNIT WEIGHT	QTY	ZONE
					VAR NO	MATERIAL SPECN					
	14	PL 6x25x600				150110920000			0.700		
						IS2062GrA			2		
	13	PL 6x6x10				159422770000	C		0.010		
						SA387Gr12Cl2			2		
	12	PL 5x50x201				150113080000	C		0.403		
						SA240TYP304			1		
	11	PL 5x50x207.5	4-11-236-01907			150113080000	C		0.410		
						SA240TYP304			1		
	10	PL 5x50x155				150113080000	C		0.311		
						SA240TYP304			4		
	09	STOPPER PLATE PL 6x30x20	4-11-038-02944			150110920000			0.020		
						IS2062GrA			32		
	08	STRAP SADDLE	2-11-236-01924						1.500		
						WELDMENT			48		
	07	PL 6x25x400				150110920000			0.471		
						IS2062GrA			8		
	06	U-PLATE 6x20x128	4-11-236-00926			150110920000			0.120		
						IS2062GrA			44		
	05	TUBE Ø44.5x5.6 3209 LONG				154870202151	A		18.300		
						SA210GrC			2		
	04	CIRCUIT-04	2-11-237-11312			WELDMENT			194.830		
									2		
	03	CIRCUIT-03	2-11-237-11311			WELDMENT			211.200		
									2		
	02	CIRCUIT-02	2-11-237-11310			WELDMENT			200.700		
									2		
	01	CIRCUIT-01	2-11-237-11309			WELDMENT			200.850		
									2		

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be reproduced or transmitted in any way detrimental to the interest of the company.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT				DRN		NAME S.R.K		SIGNATURE		DATE	
355-053				CHD		S.ANAND KUMAR		05/12/2009		04/12/2009	
DEPT PP				APPD		S.ANAND KUMAR		05/12/2009			
CODE 121				ALL DIMENSIONS ARE IN MM		PROJECTION		SCALE		WEIGHT (Kg)	
TITLE				N.T.S				1736.925		REF TO ASSY / OLD DWG	
LTSH LOWER COIL ASSY				DRAWING NO :		1-11-237-02677		REV		00	

NOTES: -

01. DESIGN, MANUFACTURE AND INSPECTION AS PER IBR.

USED IN ITEM NOS.	01 TO 04	01 & 02	03	04	05
TUBE SIZE & MATERIAL	Ø44.5x5.0 SA213T11	Ø44.5x4.5 SA210GrC	Ø44.5x5.0 SA210GrC	Ø44.5x4.0 SA210GrC	Ø44.5x5.6 SA210GrC
02. DESIGN PRESSURE : KG/Sq.cm(g)	164.0	164.0	164.0	164.0	167.6
03. DESIGN TEMPERATURE : °C	435+39=474	385+39=424	382+39=421	381+39=420	292+11=303

04. HEAT TREATMENT AS PER IBR.

05. BUTT WELD EDGE PREPARATION AS PER BPS : TP 062 05 99.

06. FABRICATION TOLERANCE AS PER BPS 1-03-000-00033.

07. FOR LOCATION OF STOPPER PLATE REF.DRG. No. 3-11-036-03000

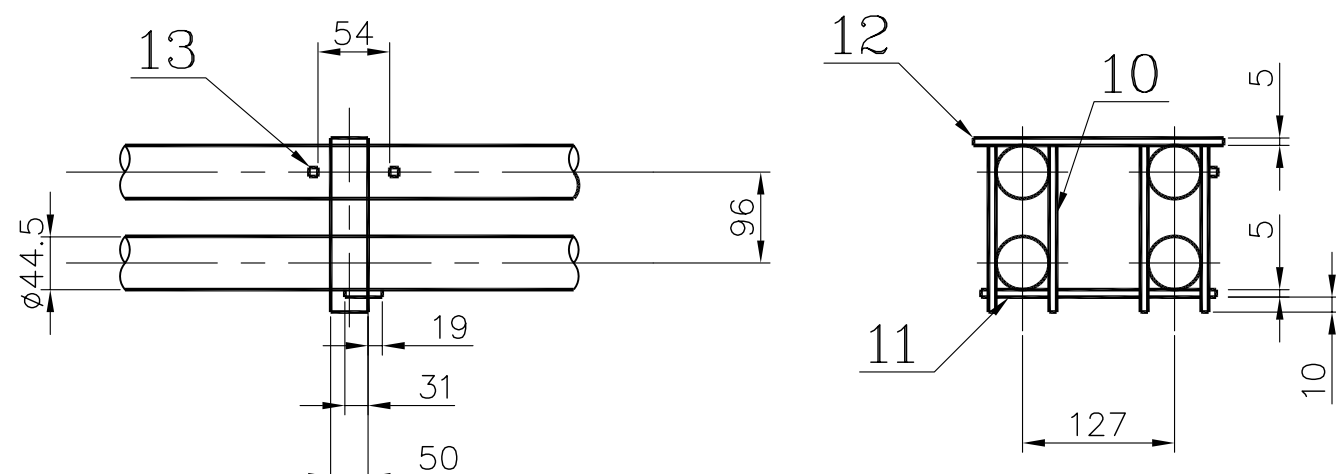
08. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.

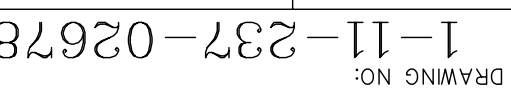
09. PAINT MARK NO. : SHSP-04

10. QUANTITY TO BE PRODUCED PER BOILER : 34 Nos.

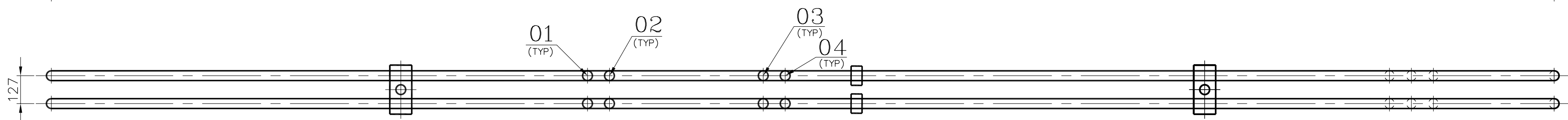
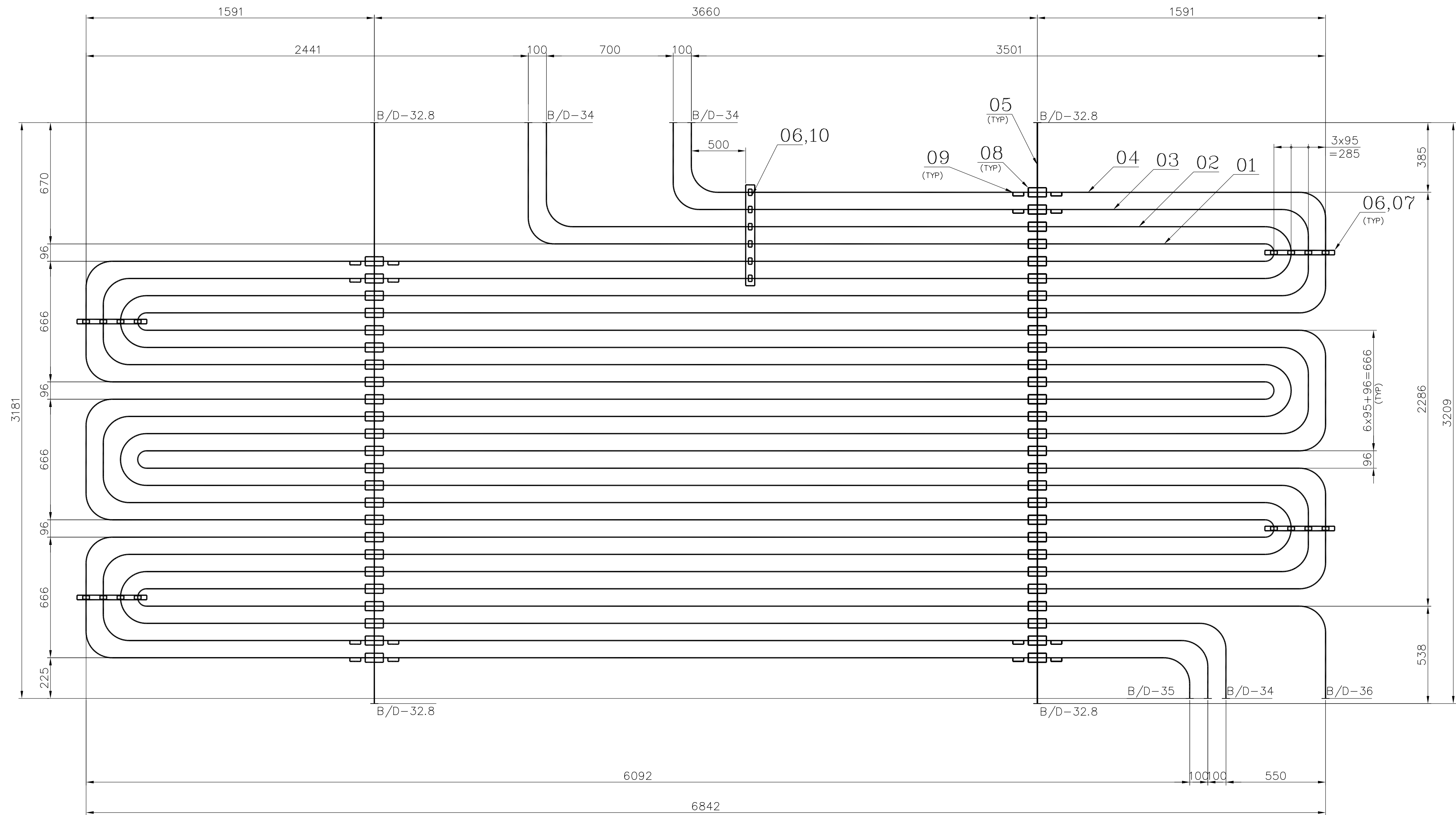
11. ITEM NOS 06, 07 & 14 ARE FOR TRANSPORTATION PURPOSE ONLY AND HAS TO BE REMOVED AT SITE BEFORE ERECTION.

DETAIL-A





FOR TOLERANCES OF UNTOLERANCED
DIMENSIONS DURING MANUFACTURE
REFER PLANT STD. NO TP 023 0299



NOTES: —

01. DESIGN, MANUFACTURE AND INSPECTION AS PER IBR.

USED IN ITEM NOS.	01 TO 04	01 & 02	03	04	05
TUBE SIZE & MATERIAL	Ø44.5x5.0 SA213T11	Ø44.5x4.5 SA210GrC	Ø44.5x5.0 SA210GrC	Ø44.5x4.0 SA210GrC	Ø44.5x5.6 SA210GrC
KG/Sq.cm(g)	164.0	164.0	164.0	164.0	167.6
RE : °C	435+39=474	385+39=424	382+39=421	381+39=420	292+11=303

02. DESIGN PRESSURE :KG/Sq.cm(g)

03. DESIGN TEMPERATURE : °C

04. HEAT TREATMENT AS PER IBR.

05. BUTT WELD EDGE PREPARATION AS PER BPS : TP 062 05 99.

06. FABRICATION TOLERANCE AS PER BPS 1-03-000-00033.

07. FOR LOCATION OF STOPPER PLATE REF.DRG. No. 3-11-036-03000

08. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.

09. PAINT MARK NO. : SHSP-05

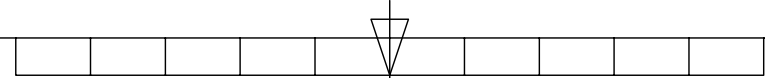
10. QUANTITY TO BE PRODUCED PER BOILER : 4 Nos.

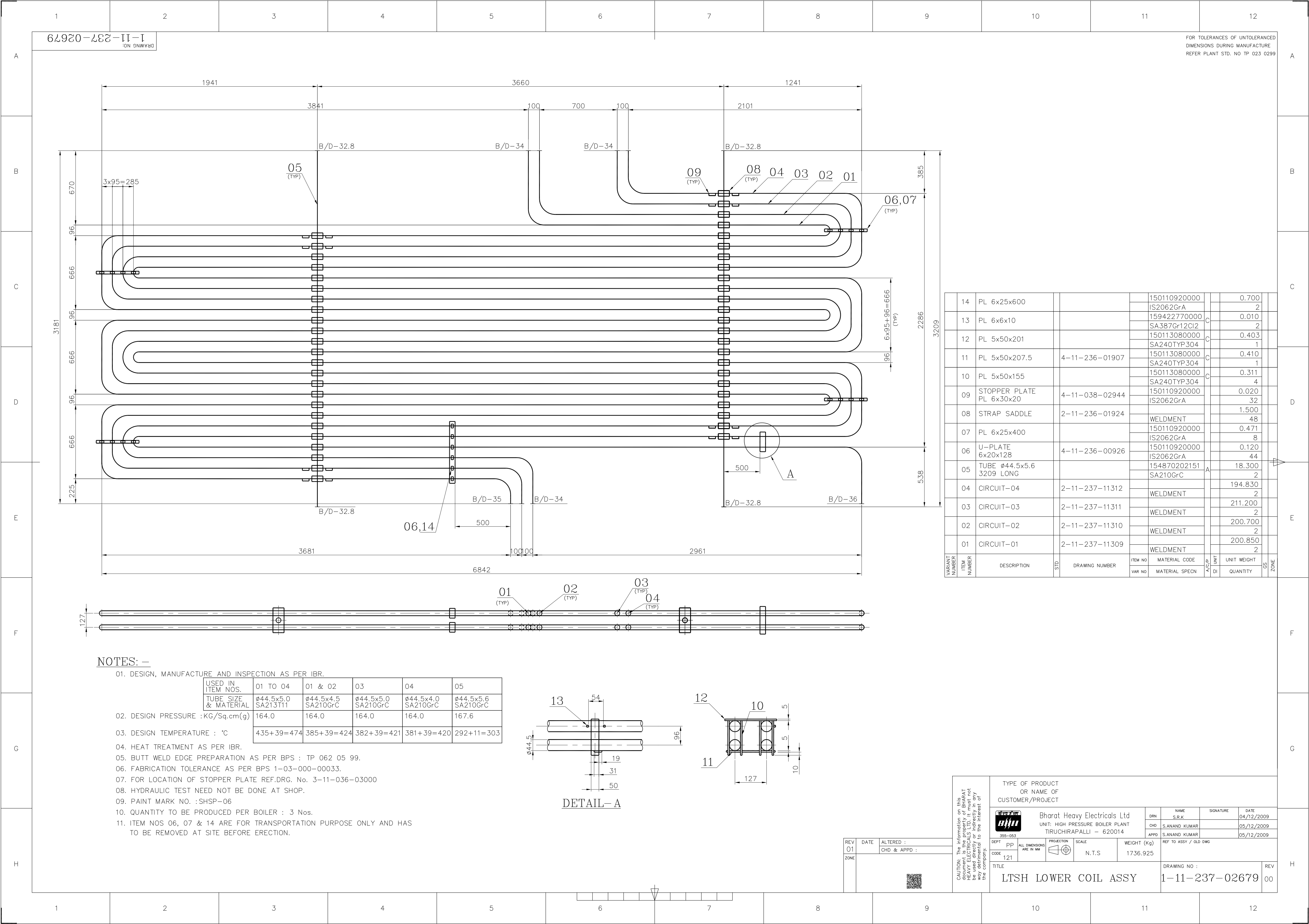
11. ITEM NOS 06, 07 & 10 ARE FOR TRANSPORTATION PURPOSE ONLY AND HAS TO BE REMOVED AT SITE BEFORE ERECTION.

REV	DATE	ALTERED :
01		CHD & APPD :
ZONE		



CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way without the prior consent of the company.	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT									
	 355-053		Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014		DRN	NAME S.R.K	SIGNATURE	DATE 04/12/2009		
					GHD	S.ANAND KUMAR		05/12/2009		
					APPD	S.ANAND KUMAR		05/12/2009		
	DEPT	PP	ALL DIMENSIONS ARE IN MM	PROJECTION 	SCALE N. T. S	WEIGHT (Kg)	REF TO ASSY / OLD DWG			
CODE	121				1869.728					
TITLE						DRAWING NO :			REV	
LTSH LOWER COIL ASSY						1-11-237-02678			00	





	14	PL 6x25x600				150110920000			0.700		
						IS2062GrA			2		
	13	PL 6x6x10				159422770000			0.010		
						SA387Gr12Cl2	C		2		
	12	PL 5x50x201				150113080000			0.403		
						SA240TYP304	C		1		
	11	PL 5x50x207.5	4-11-236-01907			150113080000			0.410		
						SA240TYP304	C		1		
	10	PL 5x50x155				150113080000			0.311		
						SA240TYP304	C		4		
	09	STOPPER PLATE PL 6x30x20	4-11-038-02944			150110920000			0.020		
						IS2062GrA			32		
	08	STRAP SADDLE	2-11-236-01924						1.500		
						WELDMENT			48		
	07	PL 6x25x400				150110920000			0.471		
						IS2062GrA			8		
	06	U-PLATE 6x20x128	4-11-236-00926			150110920000			0.120		
						IS2062GrA			44		
	05	TUBE ø44.5x5.6 3209 LONG				154870202151		A	18.300		
						SA210GrC			2		
	04	CIRCUIT-04	2-11-237-11312						194.830		
						WELDMENT			2		
	03	CIRCUIT-03	2-11-237-11311						211.200		
						WELDMENT			2		
	02	CIRCUIT-02	2-11-237-11310						200.700		
						WELDMENT			2		
	01	CIRCUIT-01	2-11-237-11309						200.850		
						WELDMENT			2		
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO	MATERIAL CODE	A/C/P	UNIT	UNIT WEIGHT	CS	ZONE
					VAR NO	MATERIAL SPECN	DI		QUANTITY		

NOTES: -

01. DESIGN, MANUFACTURE AND INSPECTION AS PER IBR.

USED IN ITEM NOS.	01 TO 04	01 & 02	03	04	05
TUBE SIZE & MATERIAL	ø44.5x5.0 SA213T11	ø44.5x4.5 SA210GrC	ø44.5x5.0 SA210GrC	ø44.5x4.0 SA210GrC	ø44.5x5.6 SA210GrC
02. DESIGN PRESSURE : KG/Sq.cm(g)	164.0	164.0	164.0	164.0	167.6
03. DESIGN TEMPERATURE : °C	435+39=474	385+39=424	382+39=421	381+39=420	292+11=303

04. HEAT TREATMENT AS PER IBR.

05. BUTT WELD EDGE PREPARATION AS PER BPS : TP 062 05 99.

06. FABRICATION TOLERANCE AS PER BPS 1-03-000-00033.

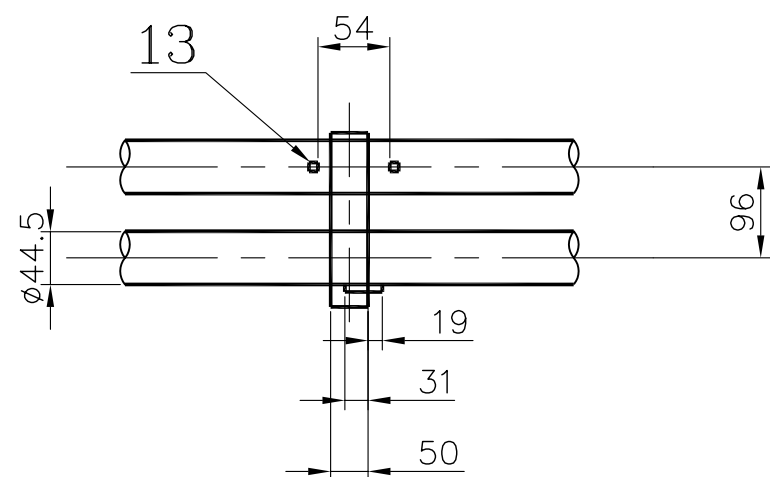
07. FOR LOCATION OF STOPPER PLATE REF.DRG. No. 3-11-036-03000

08. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.

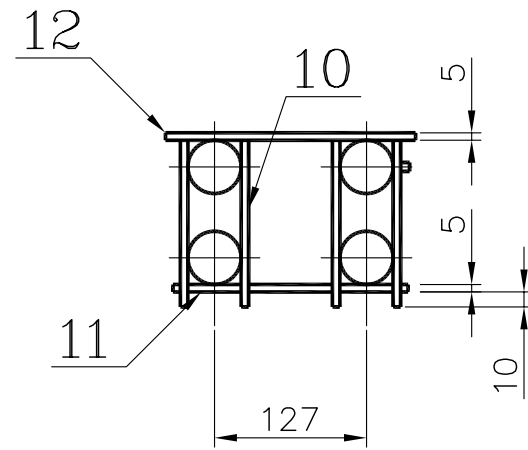
09. PAINT MARK NO. : SHSP-06

10. QUANTITY TO BE PRODUCED PER BOILER : 3 Nos.

11. ITEM NOS 06, 07 & 14 ARE FOR TRANSPORTATION PURPOSE ONLY AND HAS TO BE REMOVED AT SITE BEFORE ERECTION.



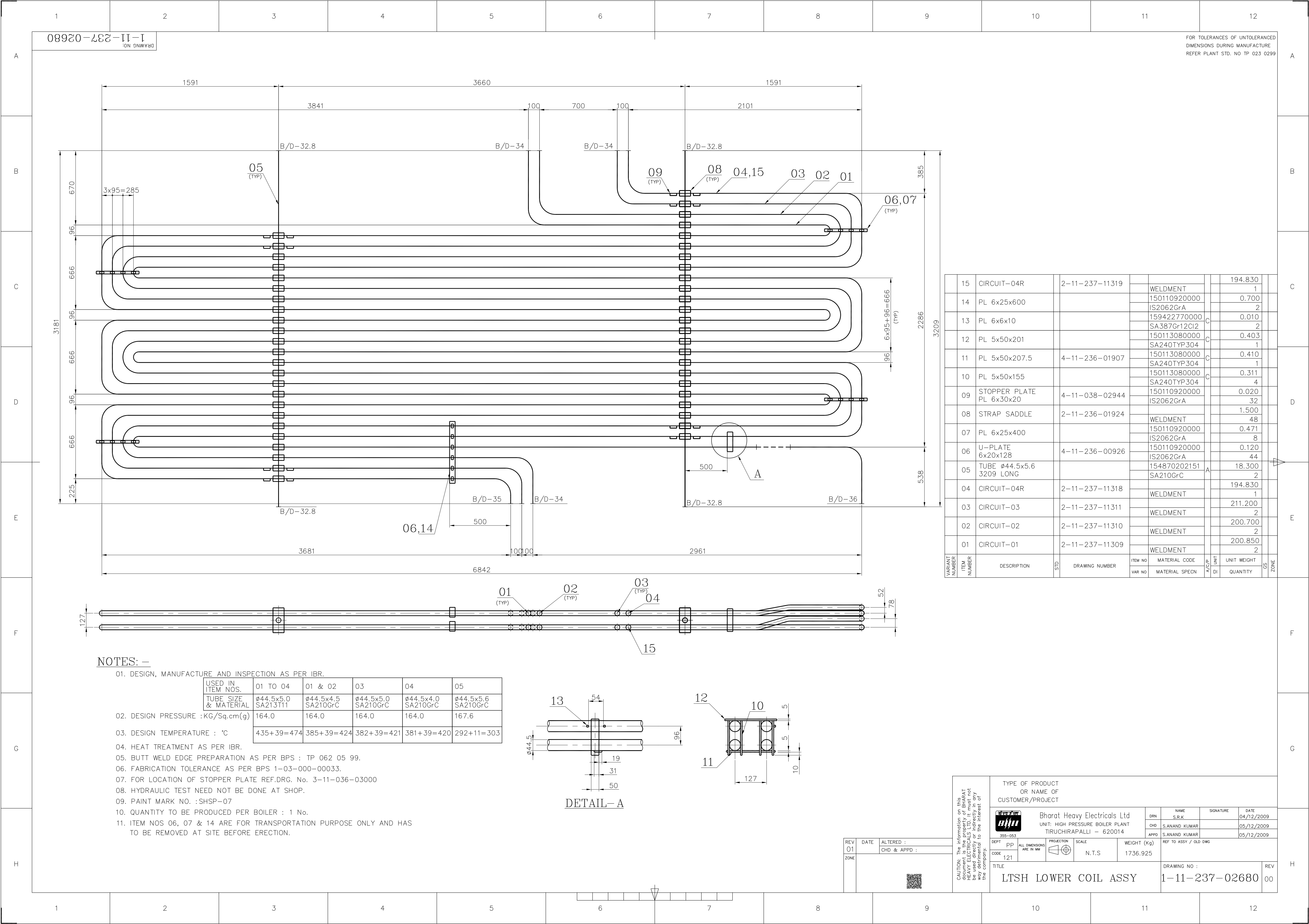
DETAIL-A



REV 01	DATE	ALTERED : CHD & APPD :
ZONE		

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be reproduced or transmitted in any way detrimental to the interest of the company.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT													
		Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014				DRN S.R.K		NAME S.R.K		SIGNATURE		DATE 04/12/2009	
355-053						CHD S.ANAND KUMAR						05/12/2009	
						APPD S.ANAND KUMAR						05/12/2009	
DEPT PP		ALL DIMENSIONS ARE IN MM		PROJECTION 		SCALE N.T.S		WEIGHT (Kg) 1736.925		REF TO ASSY / OLD DWG			
CODE 121													
TITLE LTSH LOWER COIL ASSY								DRAWING NO : 1-11-237-02679				REV 00	



	15	CIRCUIT-04R		2-11-237-11319		WELDMNT			194.830		
						150110920000			1		
	14	PL 6x25x600				IS2062GrA			0.700		
									2		
	13	PL 6x6x10				159422770000			0.010		
						SA387Gr12Cl2	C		2		
	12	PL 5x50x201				150113080000			0.403		
						SA240TYP304	C		1		
	11	PL 5x50x207.5		4-11-236-01907		150113080000			0.410		
						SA240TYP304	C		1		
	10	PL 5x50x155				150113080000			0.311		
						SA240TYP304	C		4		
	09	STOPPER PLATE PL 6x30x20		4-11-038-02944		150110920000			0.020		
						IS2062GrA			32		
	08	STRAP SADDLE		2-11-236-01924					1.500		
						WELDMNT			48		
	07	PL 6x25x400				150110920000			0.471		
						IS2062GrA			8		
	06	U-PLATE 6x20x128		4-11-236-00926		150110920000			0.120		
						IS2062GrA			44		
	05	TUBE Ø44.5x5.6 3209 LONG				154870202151			18.300		
						SA210GrC	A		2		
	04	CIRCUIT-04R		2-11-237-11318					194.830		
						WELDMNT			1		
	03	CIRCUIT-03		2-11-237-11311					211.200		
						WELDMNT			2		
	02	CIRCUIT-02		2-11-237-11310					200.700		
						WELDMNT			2		
	01	CIRCUIT-01		2-11-237-11309					200.850		
						WELDMNT			2		
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO	MATERIAL CODE	A/C/P	UNIT	UNIT WEIGHT	CS	ZONE
					VAR NO	MATERIAL SPECN		DI	QUANTITY		

NOTES: -

01. DESIGN, MANUFACTURE AND INSPECTION AS PER IBR.

USED IN ITEM NOS.	01 TO 04	01 & 02	03	04	05
TUBE SIZE & MATERIAL	$\varnothing$ 44.5x5.0 SA213T11	$\varnothing$ 44.5x4.5 SA210GrC	$\varnothing$ 44.5x5.0 SA210GrC	$\varnothing$ 44.5x4.0 SA210GrC	$\varnothing$ 44.5x5.6 SA210GrC
DESIGN PRESSURE : KG/Sq.cm(g)	164.0	164.0	164.0	164.0	167.6
DESIGN TEMPERATURE : °C	435+39=474	385+39=424	382+39=421	381+39=420	292+11=303

02. DESIGN PRESSURE : KG/Sq.cm(g)

03. DESIGN TEMPERATURE : °C

04. HEAT TREATMENT AS PER IBR.

05. BUTT WELD EDGE PREPARATION AS PER BPS : TP 062 05 99.

06. FABRICATION TOLERANCE AS PER BPS 1-03-000-00033.

07. FOR LOCATION OF STOPPER PLATE REF.DRG. No. 3-11-036-03000

08. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.

09. PAINT MARK NO. : SHSP-07

10. QUANTITY TO BE PRODUCED PER BOILER : 1 No.

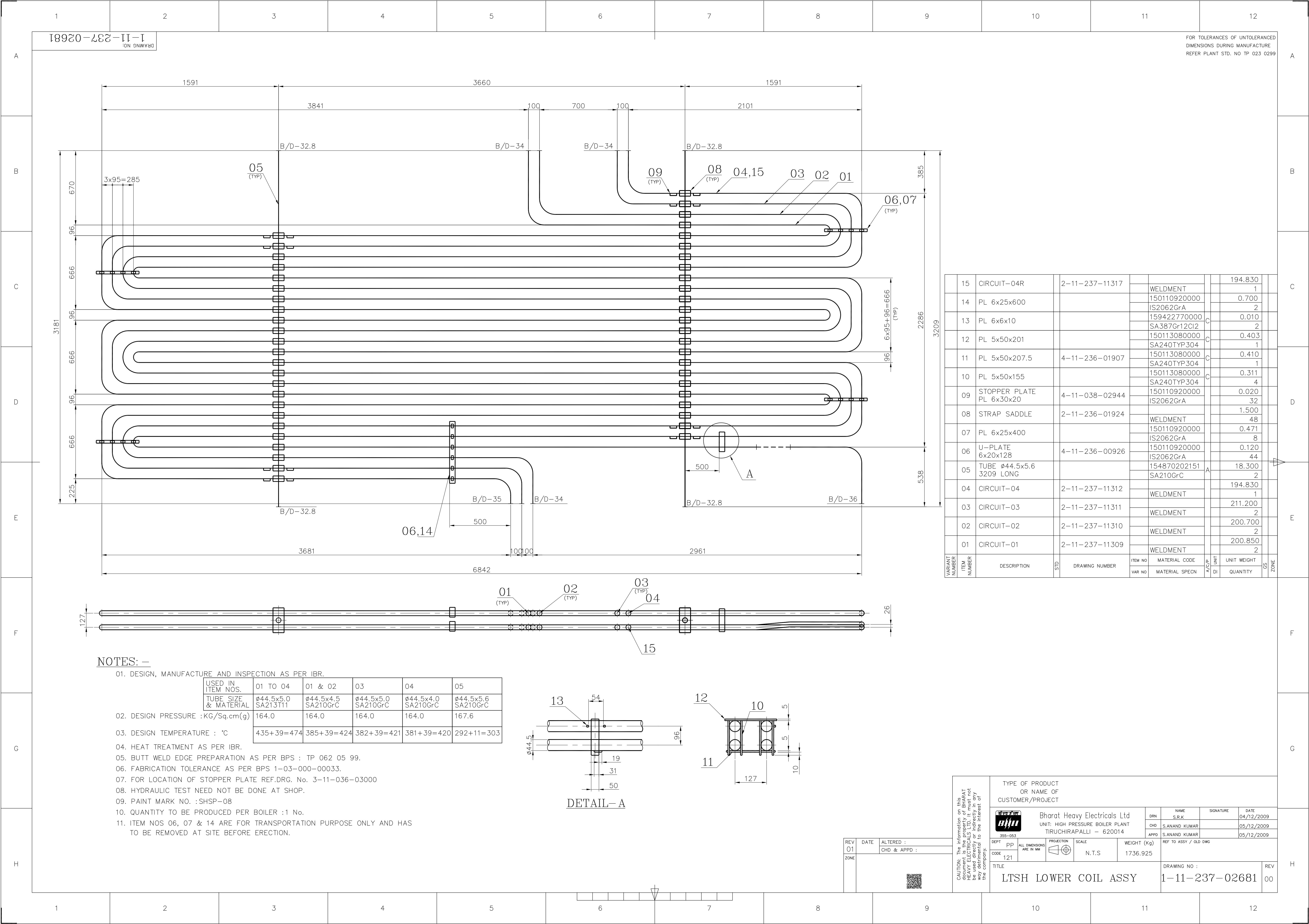
11. ITEM NOS 06, 07 & 14 ARE FOR TRANSPORTATION PURPOSE ONLY AND HAS

TO BE REMOVED AT SITE BEFORE ERECTION.

DETAIL- A

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be reproduced or transmitted in any way detrimental to the interest of the company.	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT							
			Bharat Heavy Electricals Ltd					
	UNIT: HIGH PRESSURE BOILER PLANT		DRN	NAME S.R.K	SIGNATURE	DATE 04/12/2009		
	TIRUCHIRAPALLI - 620014		CHD	S.ANAND KUMAR		05/12/2009		
			APPD	S.ANAND KUMAR		05/12/2009		
355-053		DEPT PP	ALL DIMENSIONS ARE IN MM	PROJECTION 	SCALE N.T.S	WEIGHT (Kg) 1736.925	REF TO ASSY / OLD DWG	
CODE 121		TITLE LTSH LOWER COIL ASSY				DRAWING NO : 1-11-237-02680		REV 00

REV 01	DATE	ALTERED : CHD & APPD :
ZONE		



	15	CIRCUIT-04R		2-11-237-11317		WELDMENT			194.830		
						150110920000			1		
	14	PL 6x25x600				IS2062GrA			0.700		
									2		
	13	PL 6x6x10				159422770000			0.010		
						SA387Gr12Cl2	C		2		
	12	PL 5x50x201				150113080000			0.403		
						SA240TYP304	C		1		
	11	PL 5x50x207.5		4-11-236-01907		150113080000			0.410		
						SA240TYP304	C		1		
	10	PL 5x50x155				150113080000			0.311		
						SA240TYP304	C		4		
	09	STOPPER PLATE PL 6x30x20		4-11-038-02944		150110920000			0.020		
						IS2062GrA			32		
	08	STRAP SADDLE		2-11-236-01924					1.500		
						WELDMENT			48		
	07	PL 6x25x400				150110920000			0.471		
						IS2062GrA			8		
	06	U-PLATE 6x20x128		4-11-236-00926		150110920000			0.120		
						IS2062GrA			44		
	05	TUBE Ø44.5x5.6 3209 LONG				154870202151			18.300		
						SA210GrC	A		2		
	04	CIRCUIT-04		2-11-237-11312					194.830		
						WELDMENT			1		
	03	CIRCUIT-03		2-11-237-11311					211.200		
						WELDMENT			2		
	02	CIRCUIT-02		2-11-237-11310					200.700		
						WELDMENT			2		
	01	CIRCUIT-01		2-11-237-11309					200.850		
						WELDMENT			2		
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO	MATERIAL CODE	A/C/P	UNIT	UNIT WEIGHT	QTY	ZONE
					VAR NO	MATERIAL SPECN		DI	QUANTITY		

NOTES: -

01. DESIGN, MANUFACTURE AND INSPECTION AS PER IBR.

USED IN ITEM NOS.	01 TO 04	01 & 02	03	04	05
TUBE SIZE & MATERIAL	Ø44.5x5.0 SA213T11	Ø44.5x4.5 SA210GrC	Ø44.5x5.0 SA210GrC	Ø44.5x4.0 SA210GrC	Ø44.5x5.6 SA210GrC
02. DESIGN PRESSURE : KG/Sq.cm(g)	164.0	164.0	164.0	164.0	167.6
03. DESIGN TEMPERATURE : °C	435+39=474	385+39=424	382+39=421	381+39=420	292+11=303

04. HEAT TREATMENT AS PER IBR.

05. BUTT WELD EDGE PREPARATION AS PER BPS : TP 062 05 99.

06. FABRICATION TOLERANCE AS PER BPS 1-03-000-00033.

07. FOR LOCATION OF STOPPER PLATE REF.DRG. No. 3-11-036-03000

08. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.

09. PAINT MARK NO. : SHSP-08

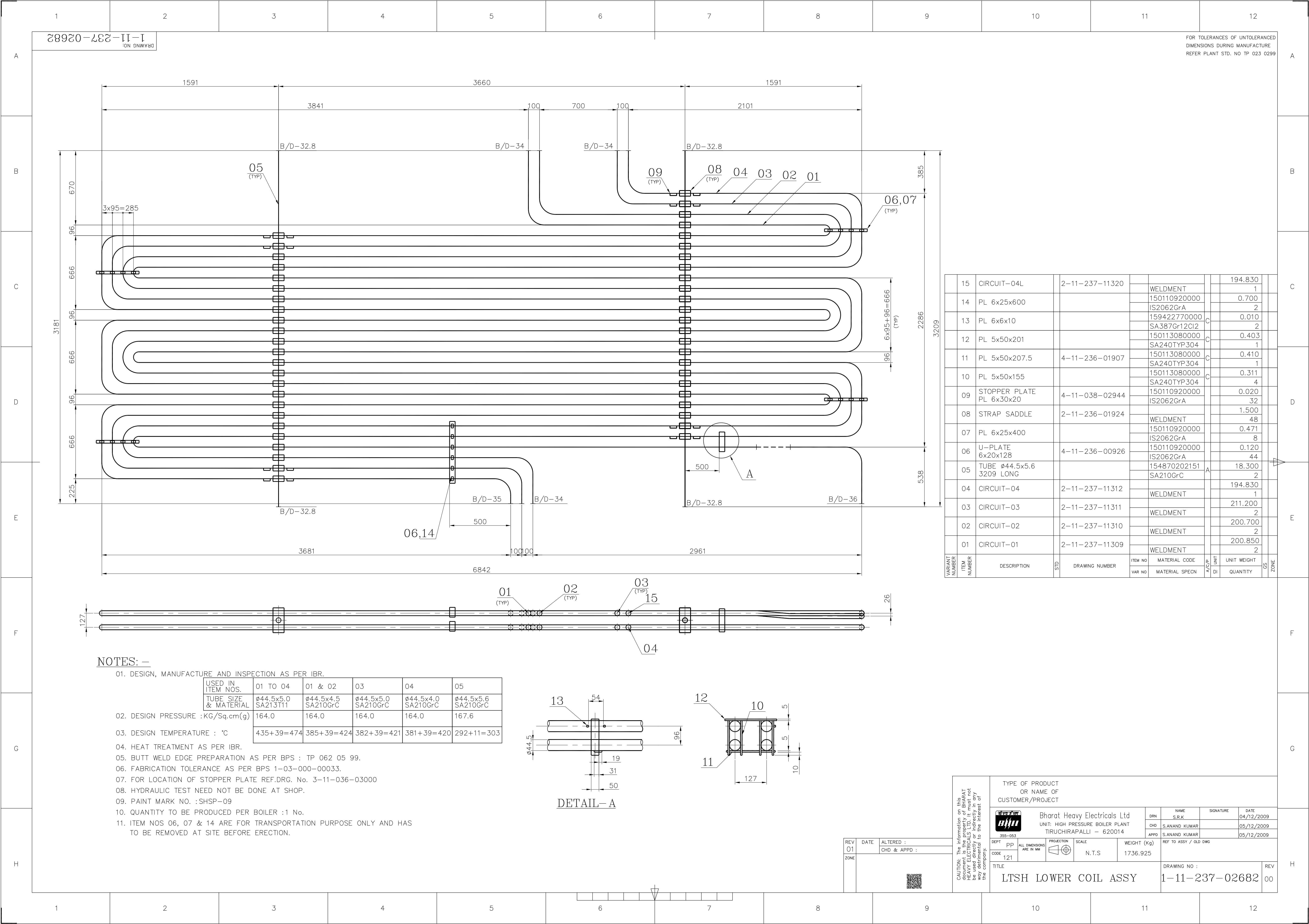
10. QUANTITY TO BE PRODUCED PER BOILER : 1 No.

11. ITEM NOS 06, 07 & 14 ARE FOR TRANSPORTATION PURPOSE ONLY AND HAS TO BE REMOVED AT SITE BEFORE ERECTION.

DETAIL- A

REV 01	DATE	ALTERED : CHD & APPD :
ZONE		

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT					
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be reproduced or transmitted in any way detrimental to the interest of the company.	Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014		DRN	NAME S.R.K	SIGNATURE
	CHD		S.ANAND KUMAR	05/12/2009	04/12/2009
	APPD		S.ANAND KUMAR	05/12/2009	05/12/2009
DEPT PP	ALL DIMENSIONS ARE IN MM	PROJECTION 	SCALE N.T.S	WEIGHT (Kg) 1736.925	REF TO ASSY / OLD DWG
CODE 121					
TITLE LTSH LOWER COIL ASSY			DRAWING NO : 1-11-237-02681		REV 00



1-11-237-02682
DRAWING NO.

FOR TOLERANCES OF UNTOLERANCED
DIMENSIONS DURING MANUFACTURE
REFER PLANT STD. NO TP 023 0299

15	CIRCUIT-04L	2-11-237-11320	WELDMENT	194.830		
14	PL 6x25x600		150110920000	0.700		
13	PL 6x6x10		IS2062GrA	2		
12	PL 5x50x201		159422770000	0.010		
11	PL 5x50x207.5	4-11-236-01907	SA387Gr12Cl2	2		
10	PL 5x50x155		150113080000	0.403		
09	STOPPER PLATE PL 6x30x20	4-11-038-02944	SA240TYP304	1		
08	STRAP SADDLE	2-11-236-01924	150113080000	0.410		
07	PL 6x25x400		SA240TYP304	1		
06	U-PLATE 6x20x128	4-11-236-00926	150113080000	0.311		
05	TUBE Ø44.5x5.6 3209 LONG		SA240TYP304	4		
04	CIRCUIT-04	2-11-237-11312	150110920000	0.020		
03	CIRCUIT-03	2-11-237-11311	IS2062GrA	32		
02	CIRCUIT-02	2-11-237-11310		1.500		
01	CIRCUIT-01	2-11-237-11309	WELDMENT	48		
			150110920000	0.471		
			IS2062GrA	8		
			150110920000	0.120		
			IS2062GrA	44		
			154870202151	18.300		
			SA210GrC	2		
				194.830		
			WELDMENT	1		
				211.200		
			WELDMENT	2		
				200.700		
			WELDMENT	2		
				200.850		
			WELDMENT	2		

NOTES: -

01. DESIGN, MANUFACTURE AND INSPECTION AS PER IBR.

USED IN ITEM NOS.	01 TO 04	01 & 02	03	04	05
TUBE SIZE & MATERIAL	Ø44.5x5.0 SA213T11	Ø44.5x4.5 SA210GrC	Ø44.5x5.0 SA210GrC	Ø44.5x4.0 SA210GrC	Ø44.5x5.6 SA210GrC
DESIGN PRESSURE : KG/Sq.cm(g)	164.0	164.0	164.0	164.0	167.6
DESIGN TEMPERATURE : °C	435+39=474	385+39=424	382+39=421	381+39=420	292+11=303

02. DESIGN PRESSURE : KG/Sq.cm(g)

03. DESIGN TEMPERATURE : °C

04. HEAT TREATMENT AS PER IBR.

05. BUTT WELD EDGE PREPARATION AS PER BPS : TP 062 05 99.

06. FABRICATION TOLERANCE AS PER BPS 1-03-000-00033.

07. FOR LOCATION OF STOPPER PLATE REF.DRG. No. 3-11-036-03000

08. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.

09. PAINT MARK NO. : SHSP-09

10. QUANTITY TO BE PRODUCED PER BOILER : 1 No.

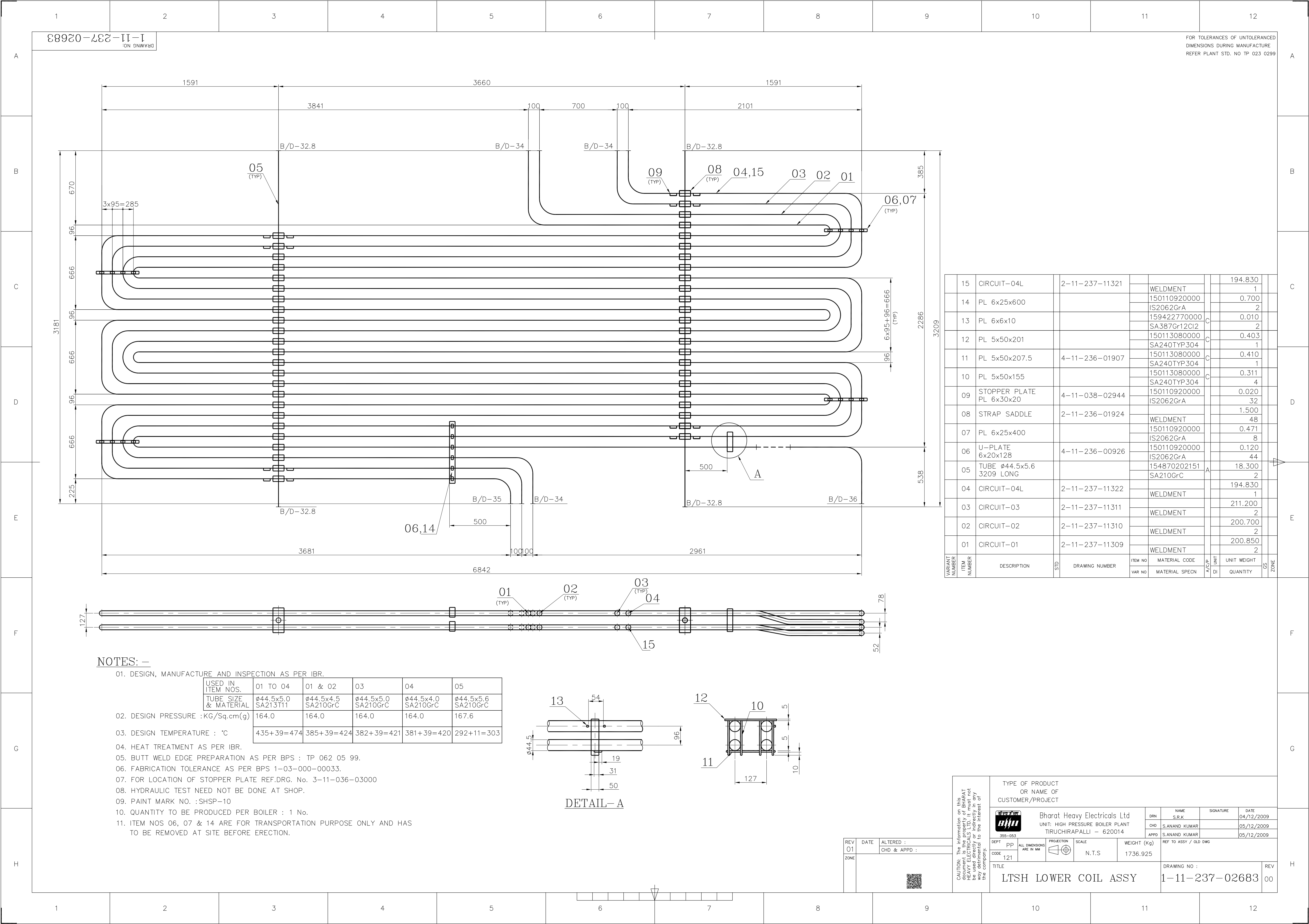
11. ITEM NOS 06, 07 & 14 ARE FOR TRANSPORTATION PURPOSE ONLY AND HAS

TO BE REMOVED AT SITE BEFORE ERECTION.

DETAIL-A

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be reproduced or transmitted in any way detrimental to the interest of the company.	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT			
	Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014		DRN NAME S.R.K	SIGNATURE DATE 04/12/2009
	355-053		CHD S.ANAND KUMAR	APPD S.ANAND KUMAR
	DEPT PP		REF TO ASSY / OLD DWG	
	CODE 121		REV 00	
TITLE LTSH LOWER COIL ASSY		DRAWING NO : 1-11-237-02682		

REV 01	DATE	ALTERED : CHD & APPD :
ZONE		



15	CIRCUIT-04L	2-11-237-11321	WELDMNT	194.830		
14	PL 6x25x600		150110920000	0.700		
13	PL 6x6x10		IS2062GrA	2		
12	PL 5x50x201		159422770000	0.010		
11	PL 5x50x207.5	4-11-236-01907	SA387Gr12Cl2	2		
10	PL 5x50x155		SA240TYP304	0.403		
09	STOPPER PLATE PL 6x30x20	4-11-038-02944	150113080000	1		
08	STRAP SADDLE	2-11-236-01924	SA240TYP304	0.410		
07	PL 6x25x400		150113080000	0.311		
06	U-PLATE 6x20x128	4-11-236-00926	SA240TYP304	4		
05	TUBE Ø44.5x5.6 3209 LONG		150110920000	0.020		
04	CIRCUIT-04L	2-11-237-11322	IS2062GrA	32		
03	CIRCUIT-03	2-11-237-11311	WELDMNT	1.500		
02	CIRCUIT-02	2-11-237-11310	150110920000	48		
01	CIRCUIT-01	2-11-237-11309	IS2062GrA	0.471		
			154870202151	8		
			SA210GrC	0.120		
			WELDMNT	44		
			WELDMNT	18.300		
			WELDMNT	2		
			WELDMNT	194.830		
			WELDMNT	1		
			WELDMNT	211.200		
			WELDMNT	2		
			WELDMNT	200.700		
			WELDMNT	2		
			WELDMNT	200.850		
			WELDMNT	2		

NOTES: -

01. DESIGN, MANUFACTURE AND INSPECTION AS PER IBR.

USED IN ITEM NOS.	01 TO 04	01 & 02	03	04	05
TUBE SIZE & MATERIAL	Ø44.5x5.0 SA213T11	Ø44.5x4.5 SA210GrC	Ø44.5x5.0 SA210GrC	Ø44.5x4.0 SA210GrC	Ø44.5x5.6 SA210GrC
DESIGN PRESSURE : KG/Sq.cm(g)	164.0	164.0	164.0	164.0	167.6
DESIGN TEMPERATURE : °C	435+39=474	385+39=424	382+39=421	381+39=420	292+11=303

02. DESIGN PRESSURE : KG/Sq.cm(g)

03. DESIGN TEMPERATURE : °C

04. HEAT TREATMENT AS PER IBR.

05. BUTT WELD EDGE PREPARATION AS PER BPS : TP 062 05 99.

06. FABRICATION TOLERANCE AS PER BPS 1-03-000-00033.

07. FOR LOCATION OF STOPPER PLATE REF.DRG. No. 3-11-036-03000

08. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.

09. PAINT MARK NO. : SHSP-10

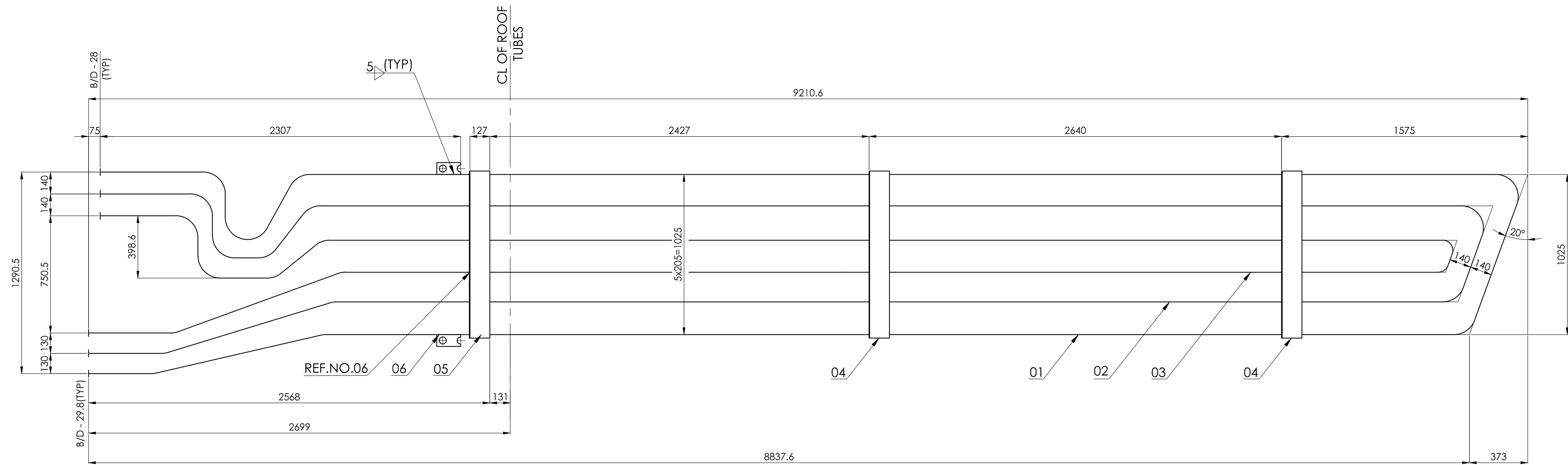
10. QUANTITY TO BE PRODUCED PER BOILER : 1 No.

11. ITEM NOS 06, 07 & 14 ARE FOR TRANSPORTATION PURPOSE ONLY AND HAS

TO BE REMOVED AT SITE BEFORE ERECTION.

DETAIL- A

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be reproduced or transmitted in any way detrimental to the interest of the company.	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT					
			Bharat Heavy Electricals Ltd			
	UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014		DRN S.R.K	SIGNATURE		
	355-053		CHD S.ANAND KUMAR	DATE 04/12/2009		
	APPD S.ANAND KUMAR		05/12/2009			
DEPT PP	ALL DIMENSIONS ARE IN MM	PROJECTION 	SCALE N.T.S	WEIGHT (Kg) 1736.925	REF TO ASSY / OLD DWG	
CODE 121	DRAWING NO : 1-11-237-02683				REV 00	
TITLE LTSH LOWER COIL ASSY						



01	06	LIFTING LUG PLATE 6x76x153	6112-4020/04	22	SA387GR22CL2	C	0.550	2	14		
	05	ROOF SEAL BAND	2-11-274-11343/01		15 942 266 SA387GR22CL2		8.400	2			
02	04	ALIGNMENT BAND	2-11-274-11344		WELDMENT		7.326	2			
	03	CIRCUIT-03	2-11-274-11341		WELDMENT		145.150	1			
02	02	CIRCUIT-02	2-11-274-11340		WELDMENT		151.980	1			
02	01	CIRCUIT-01	2-11-274-11339		WELDMENT		159.690	1			
VARIANT NUMBER		ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO	MATERIAL CODE	UNIT	UNIT WEIGHT	CS	ZONE
						VAR NO	MATERIAL SPECN	DI	QUANTITY		

NOTES:

01. DESIGN, MANUFACTURE AND INSPECTION AS PER IBR.
02. DESIGN PRESSURE & TEMPERATURE AS PER TABLE.

	SIZE	MATERIAL	DESIGN PRESSURE IN kg/cm ² (g)	DESIGN TEMPERATURE IN °C	USED IN
01	Ø44.5x8.0	SA213T22	152.9	575(536+39)	01, 02 & 03
	Ø44.5x9.0	SA213T22	152.9	577(538+39)	01, 02 & 03
02	Ø44.5x7.1	SA213T22	152.9	565(526+39)	01, 02 & 03

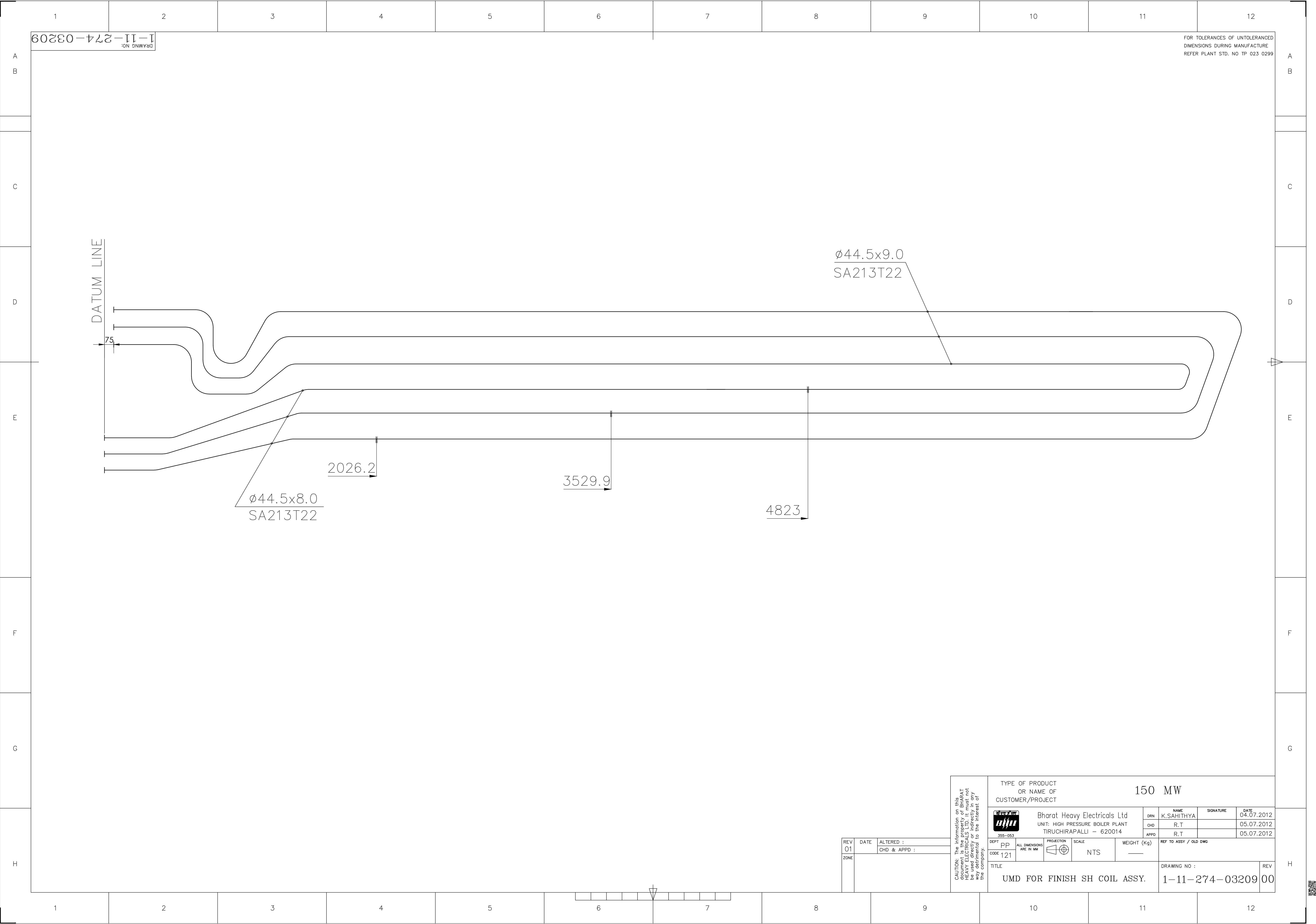
03. BUTT WELD EDGE PREPARATION AS PER BPS: TP 062 05 99.
04. HEAT TREATMENT AS PER IBR.
05. FABRICATION TOLERANCE AS PER BPS: 2-03-000-00016.
06. WELD SEAL BAND (ITEM NO. 05) AS PER: 2-11-274-11343.
07. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.
08. QUANTITY TO BE PRODUCED = 74 NOS / BOILER .

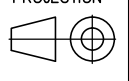
REV	DATE	ALTERED : B.ASHOK	REV	DATE	ALTERED : N.BALA
02	16.02.11	CHD & APPD : A.ARUN	01	20.01.10	CHD & APPD : A.ARUN
ZONE	IN NOTE NO: 02 TUBE SIZE D44.5X7.1 DELETED.				
E9	ITEM NO: 01 TO 03 DRG. REVISED & WEIGHT CORRECTED.				
H11					
			F1	DESIGN TEMP. CORRECTED IN LINE WITH PPA DRG.	
			E9	REV. NO. UPDATED FOR ITEM NO.05.	
			H11	TOTAL WEIGHT CORRECTED.	

CAUTION: The information on this drawing is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

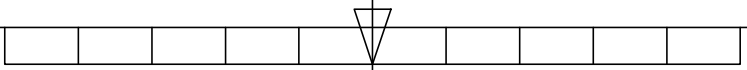
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT											
		Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014				DRN		NAME	SIGNATURE	DATE	
						CHD		A.ARUN		22.12.2009	
						APPD		A.ARUN		22.12.2009	
DEPT		PP	355-053	ALL DIMENSIONS ARE IN MM	PROJECTION 	SCALE	1:15	WEIGHT (Kg)	489.372	REF TO ASSY / OLD DWG	
CODE		121								1-02019	
TITLE										DRAWING NO :	REV
SH. VERTICAL SPACED COIL ASSY.										1-11-274-027020	02

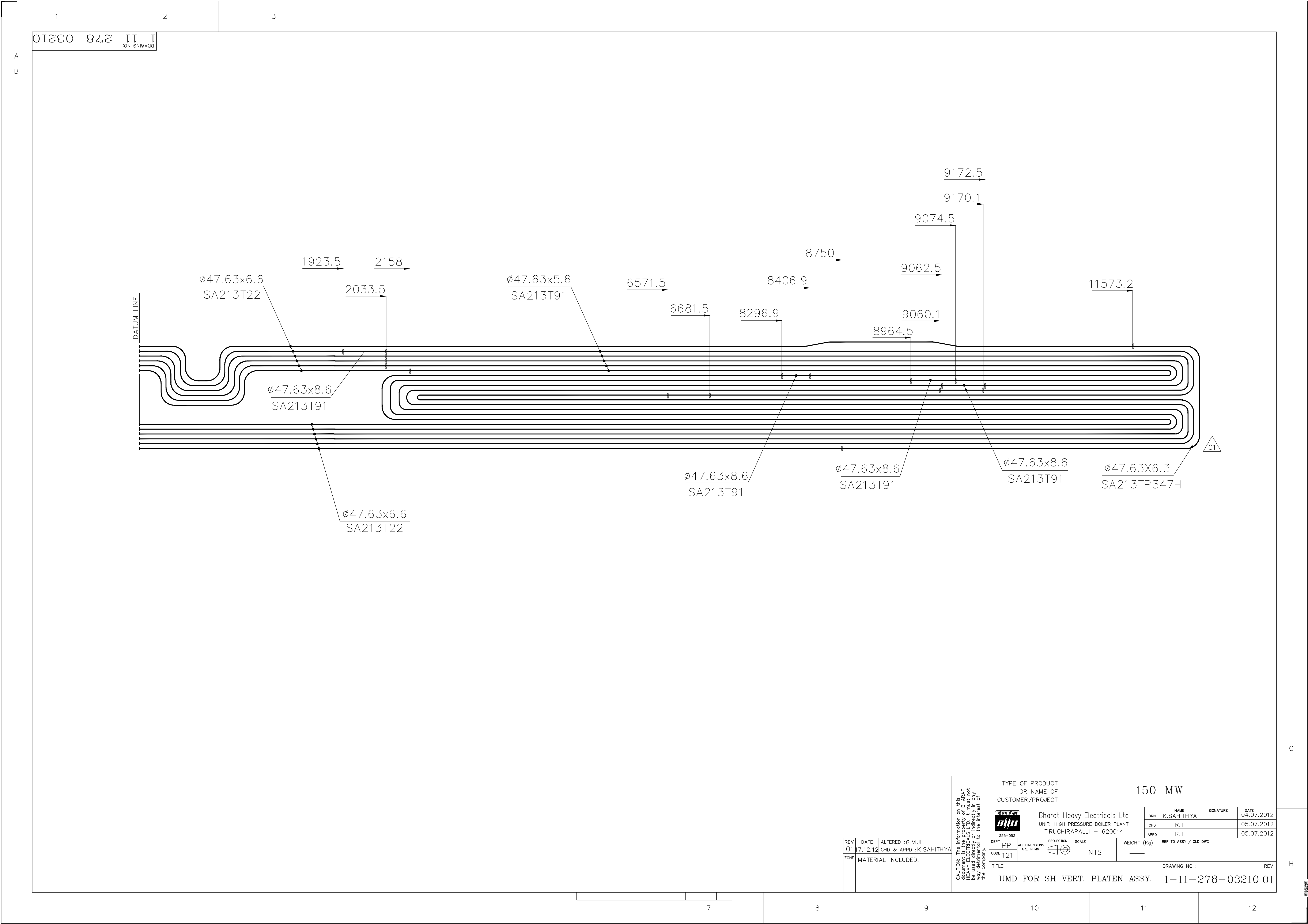




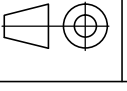
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT				150 MW			
	Bharat Heavy Electricals Ltd			DRN	K.SAHITHYA	SIGNATURE	DATE
	UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014			CHD	R.T		05.07.2012
DEPT PP	ALL DIMENSIONS ARE IN MM	PROJECTION 	SCALE NTS	WEIGHT (Kg)	REF TO ASSY / OLD DWG		
CODE 121							
TITLE UMD FOR FINISH SH COIL ASSY.						DRAWING NO : 1-11-274-03209	
						REV	00

REV 01	DATE	ALTERED : CHD & APPD :
ZONE		

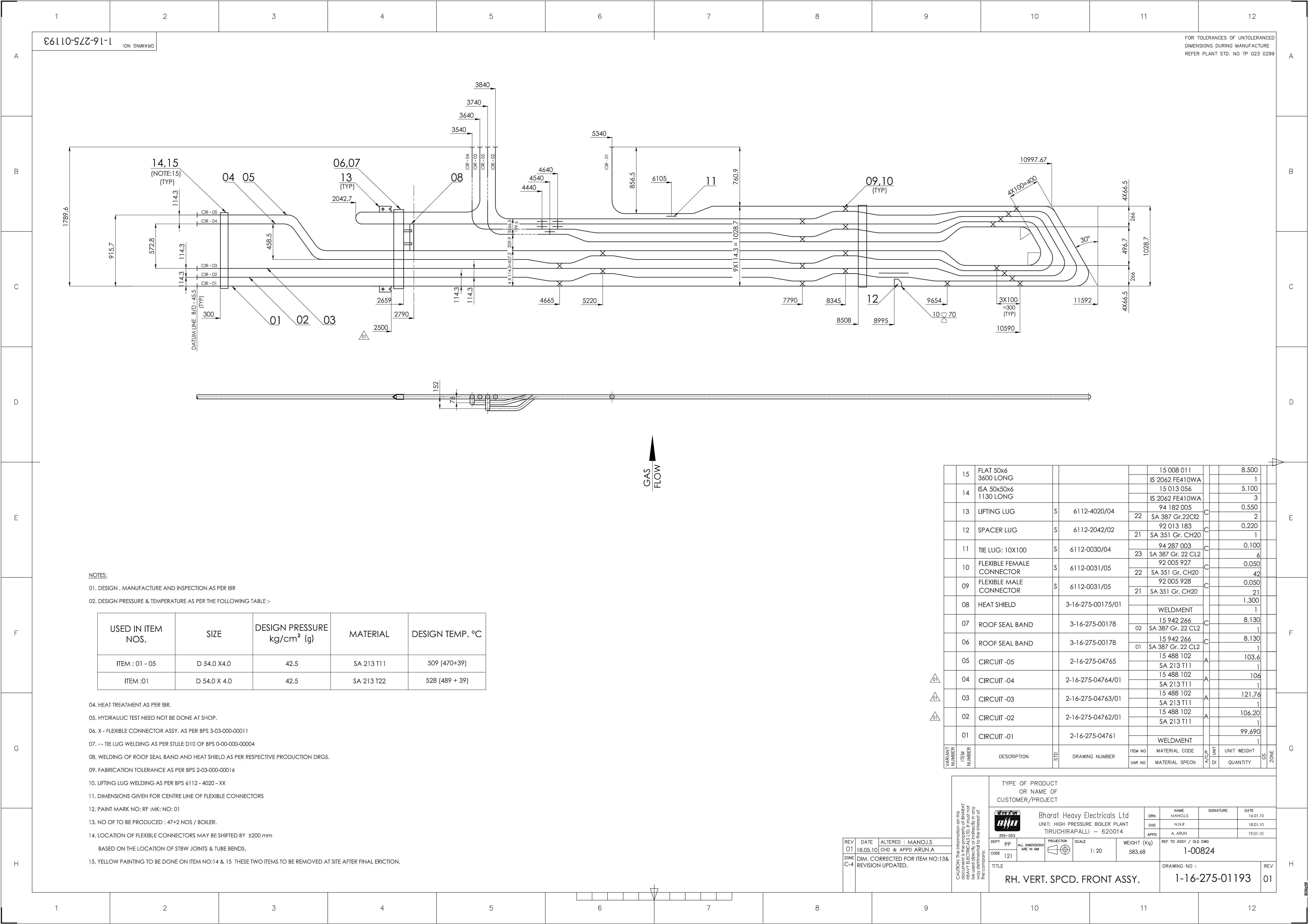




REV	DATE	ALTERED	BY
01	17.12.12	CHD & APPD	:K.SAHITHYA
MATERIAL INCLUDED.			

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT				150 MW			
	Bharat Heavy Electricals Ltd			DRN	K.SAHITHYA	SIGNATURE	DATE
	UNIT: HIGH PRESSURE BOILER PLANT			CHD	R.T		05.07.2012
	TIRUCHIRAPALLI - 620014			APPD	R.T		05.07.2012
DEPT	PP	ALL DIMENSIONS ARE IN MM	PROJECTION	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	
CODE	121			NTS			
TITLE						DRAWING NO :	REV
UMD FOR SH VERT. PLATEN ASSY.						1-11-278-03210	01





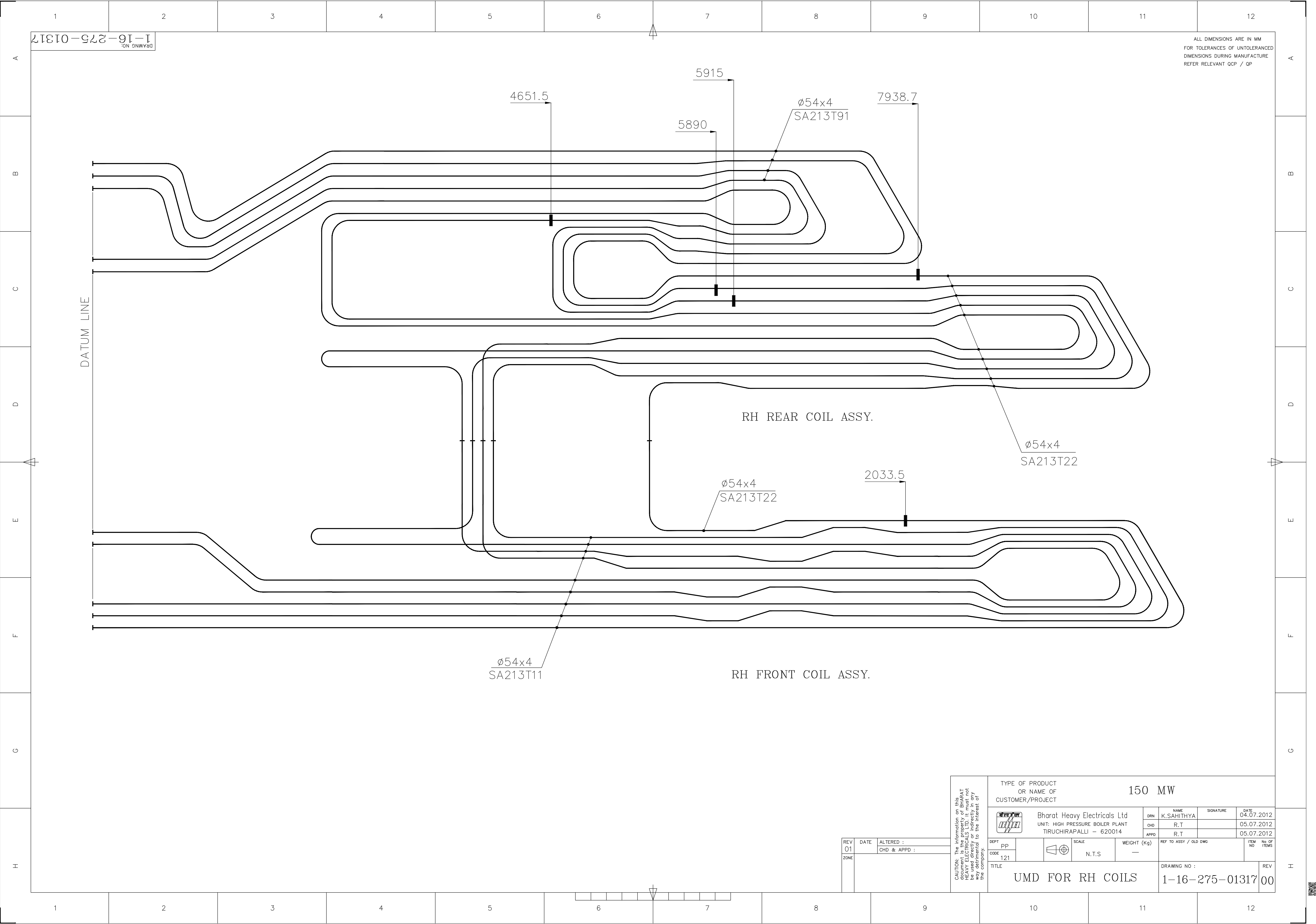
15	FLAT 50x6 3600 LONG				15 008 011		8.500		
					IS 2062 FE410WA		1		
14	ISA 50x50x6 1130 LONG				15 013 056		5.100		
					IS 2062 FE410WA		3		
13	LIFTING LUG	S	6112-4020/04		94 182 005	C	0.550		
				22	SA 387 Gr.22Cl2		2		
12	SPACER LUG	S	6112-2042/02		92 013 183	C	0.220		
				21	SA 351 Gr. CH20		1		
11	TIE LUG: 10X100	S	6112-0030/04		94 287 003	C	0.100		
				23	SA 387 Gr. 22 CL2		6		
10	FLEXIBLE FEMALE CONNECTOR	S	6112-0031/05		92 005 927	C	0.050		
				22	SA 351 Gr. CH20		42		
09	FLEXIBLE MALE CONNECTOR	S	6112-0031/05		92 005 928	C	0.050		
				21	SA 351 Gr. CH20		21		
08	HEAT SHIELD		3-16-275-00175/01				1.300		
					WELDMENT		1		
07	ROOF SEAL BAND		3-16-275-00178		15 942 266	C	8.130		
				02	SA 387 Gr. 22 CL2		1		
06	ROOF SEAL BAND		3-16-275-00178		15 942 266	C	8.130		
				01	SA 387 Gr. 22 CL2		1		
05	CIRCUIT -05		2-16-275-04765		15 488 102	A	103.6		
					SA 213 T11		1		
04	CIRCUIT -04		2-16-275-04764/01		15 488 102	A	106		
					SA 213 T11		1		
03	CIRCUIT -03		2-16-275-04763/01		15 488 102	A	121.76		
					SA 213 T11		1		
02	CIRCUIT -02		2-16-275-04762/01		15 488 102	A	106.20		
					SA 213 T11		1		
01	CIRCUIT -01		2-16-275-04761				99.690		
					WELDMENT		1		
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO	MATERIAL CODE	A/C/P	UNIT WEIGHT	GS
					VAR NO	MATERIAL SPECN	DI	QUANTITY	ZONE

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way without the prior written consent of the company.	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT			
	DEPT PP		ALL DIMENSIONS ARE IN MM	PROJECTION
	CODE 121		SCALE 1: 20	WEIGHT (Kg) 583.68
	TITLE RH. VERT. SPCD. FRONT ASSY.		DRAWING NO : 1-16-275-01193	
REV 01		DATE 18.05.10	ALTERED : MANOJ.S	REV 01
ZONE C-4		DIM. CORRECTED FOR ITEM NO:13& REVISION UPDATED.		
		DRN	NAME MANOJ.S	SIGNATURE
		CHD	N.N.R	DATE 18.01.10
		APPD	A. ARUN	DATE 19.01.10

- NOTES:
01. DESIGN , MANUFACTURE AND INSPECTION AS PER IBR
02. DESIGN PRESSURE & TEMPERATURE AS PER THE FOLLOWING TABLE :-

USED IN ITEM NOS.	SIZE	DESIGN PRESSURE kg/cm ² (g)	MATERIAL	DESIGN TEMP. °C
ITEM : 01 - 05	D 54.0 X4.0	42.5	SA 213 T11	509 (470+39)
ITEM :01	D 54.0 X 4.0	42.5	SA 213 T22	528 (489 + 39)

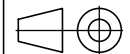
04. HEAT TREATMENT AS PER IBR.
05. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.
06. X - FLEXIBLE CONNECTOR ASSY. AS PER BPS 3-03-000-00011
07. -- TIE LUG WELDING AS PER STULE D10 OF BPS 0-00-000-00004
08. WELDING OF ROOF SEAL BAND AND HEAT SHIELD AS PER RESPECTIVE PRODUCTION DRGS.
09. FABRICATION TOLERANCE AS PER BPS 2-03-000-00016
10. LIFTING LUG WELDING AS PER BPS 6112 - 4020 - XX
11. DIMENSIONS GIVEN FOR CENTRE LINE OF FLEXIBLE CONNECTORS
12. PAINT MARK NO: RF :MK: NO: 01
13. NO OF TO BE PRODUCED : 47+2 NOS / BOILER.
14. LOCATION OF FLEXIBLE CONNECTORS MAY BE SHIFTED BY ±200 mm
BASED ON THE LOCATION OF STBW JOINTS & TUBE BENDS.
15. YELLOW PAINTING TO BE DONE ON ITEM NO:14 & 15 THESE TWO ITEMS TO BE REMOVED AT SITE AFTER FINAL ERICTION.

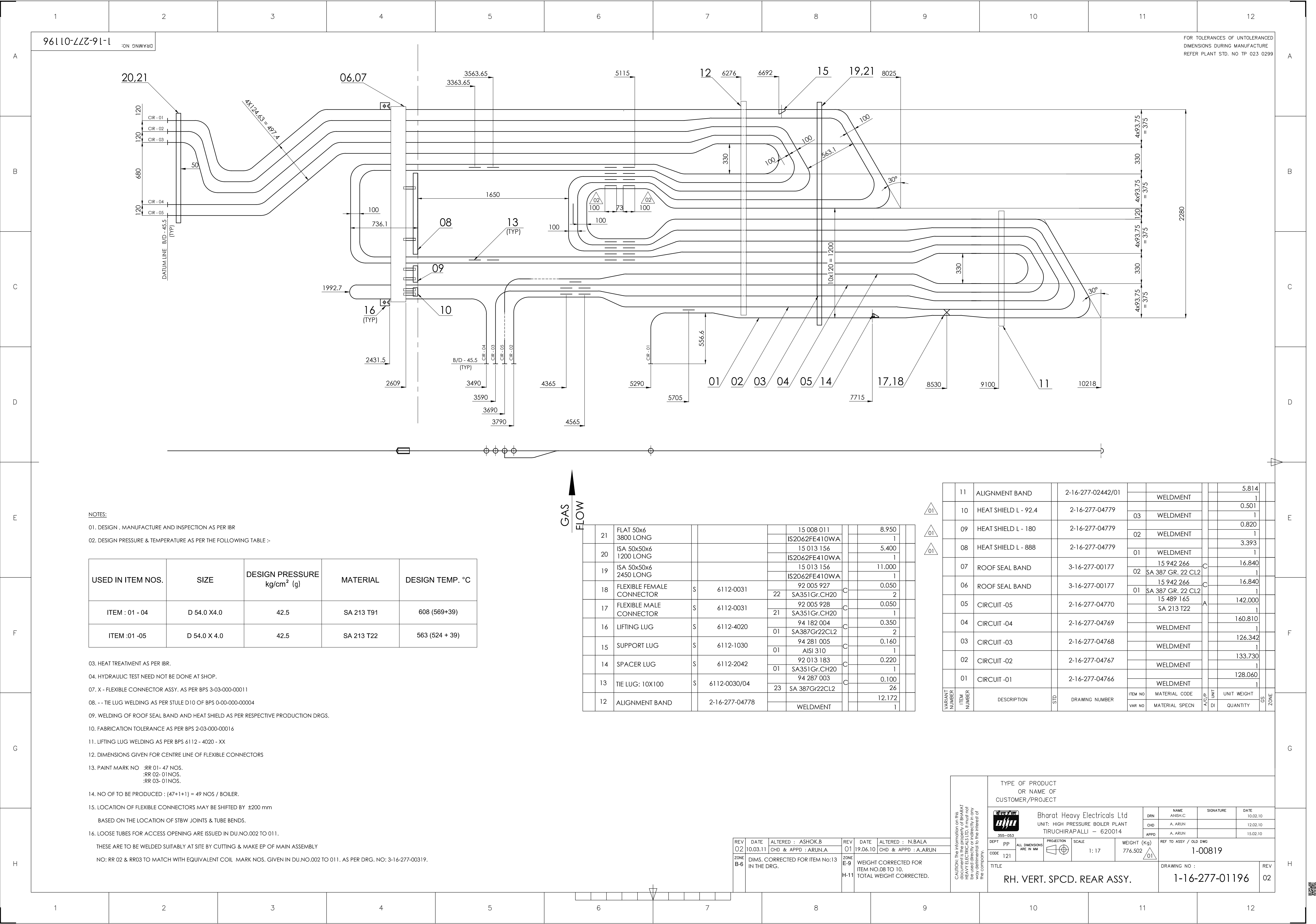


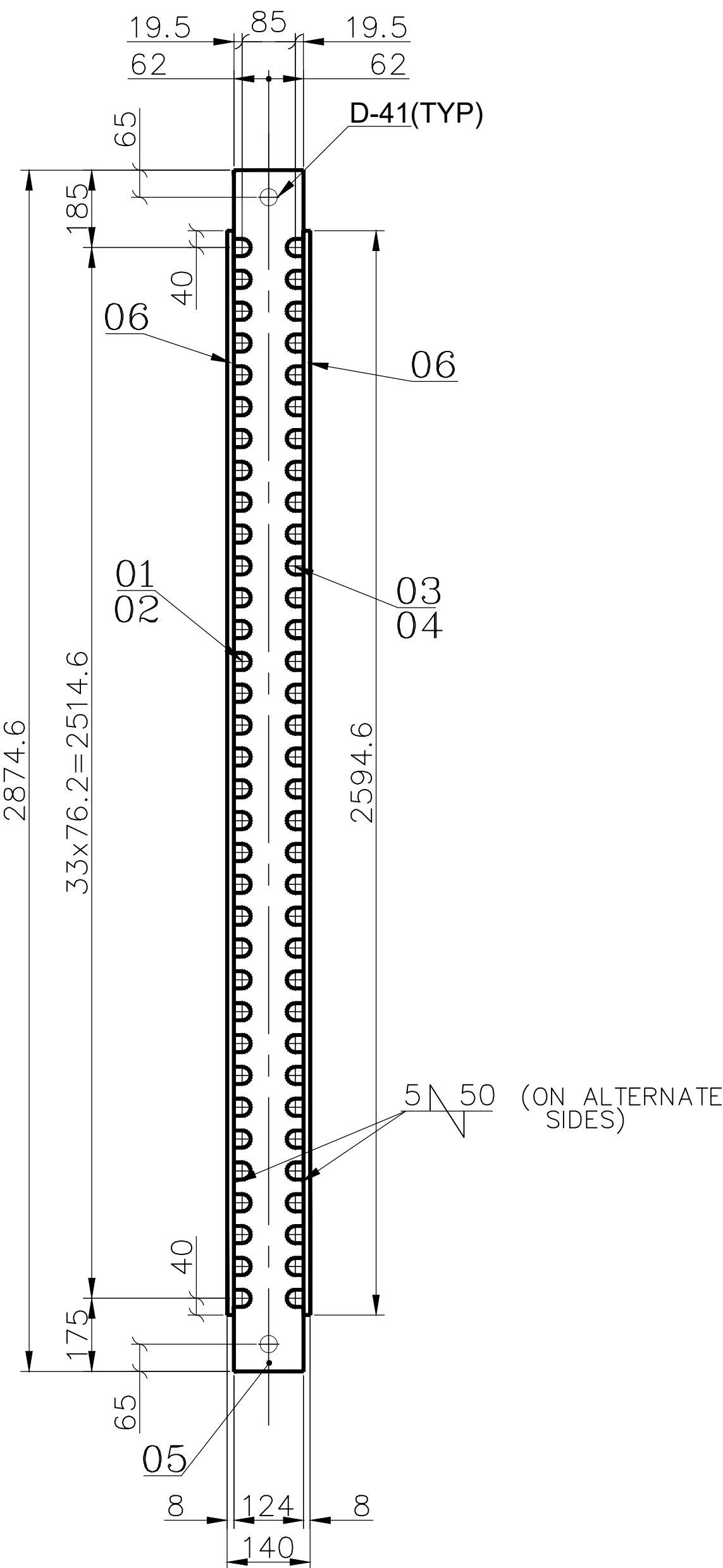
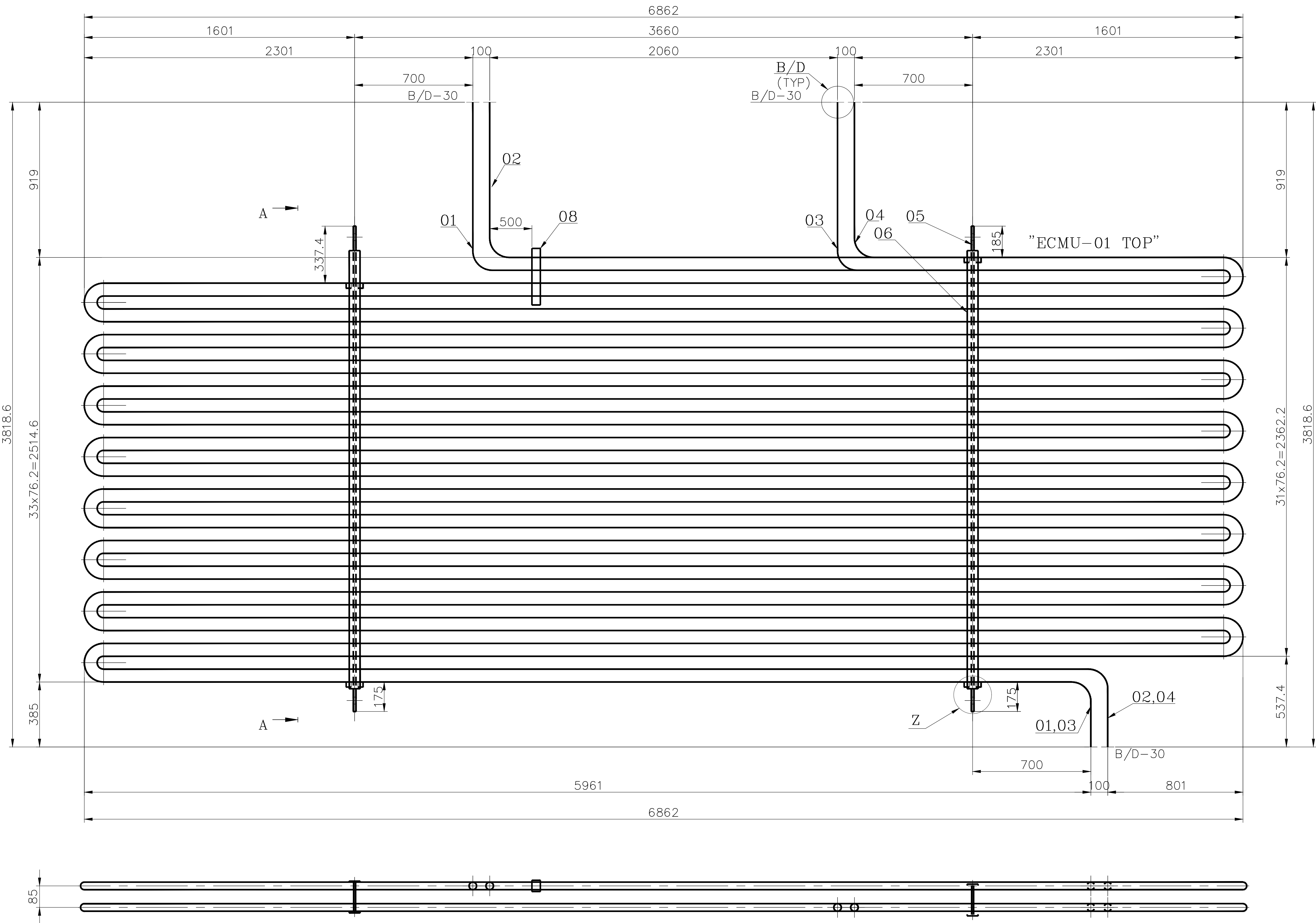
1-16-275-01317

ALL DIMENSIONS ARE IN MM
FOR TOLERANCES OF UNTOLERANCED
DIMENSIONS DURING MANUFACTURE
REFER RELEVANT QCP / QP

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT										
150 MW										
		Bharat Heavy Electricals Ltd				DRN	NAME	SIGNATURE	DATE	
		UNIT: HIGH PRESSURE BOILER PLANT				CHD	R.T		05.07.2012	
		TIRUCHIRAPALLI - 620014				APPD	R.T		05.07.2012	
DEPT	PP		SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG				ITEM NO	No OF ITEMS
CODE	121		N.T.S	—						
TITLE					DRAWING NO :				REV	
UMD FOR RH COILS					1-16-275-01317				00	

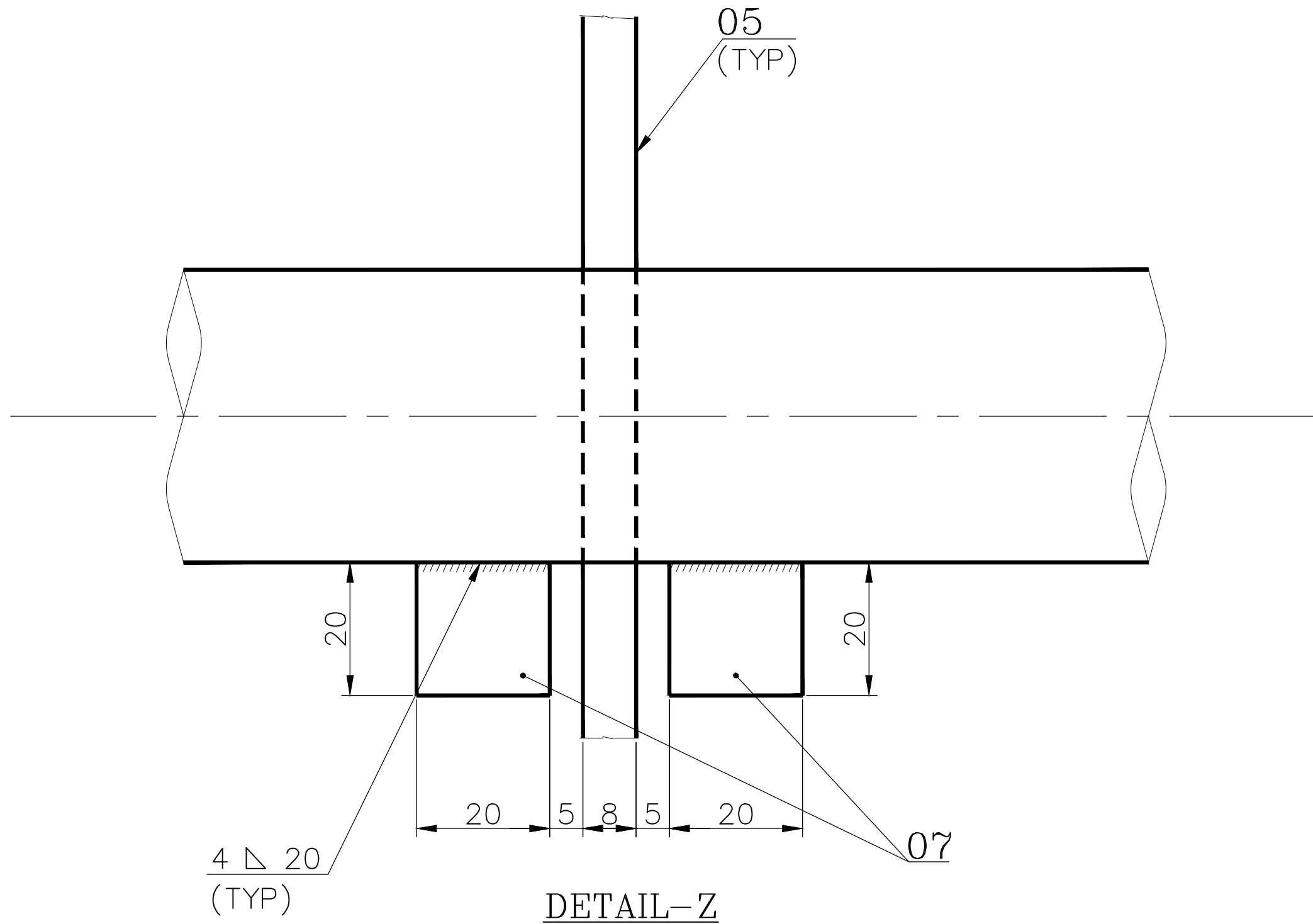
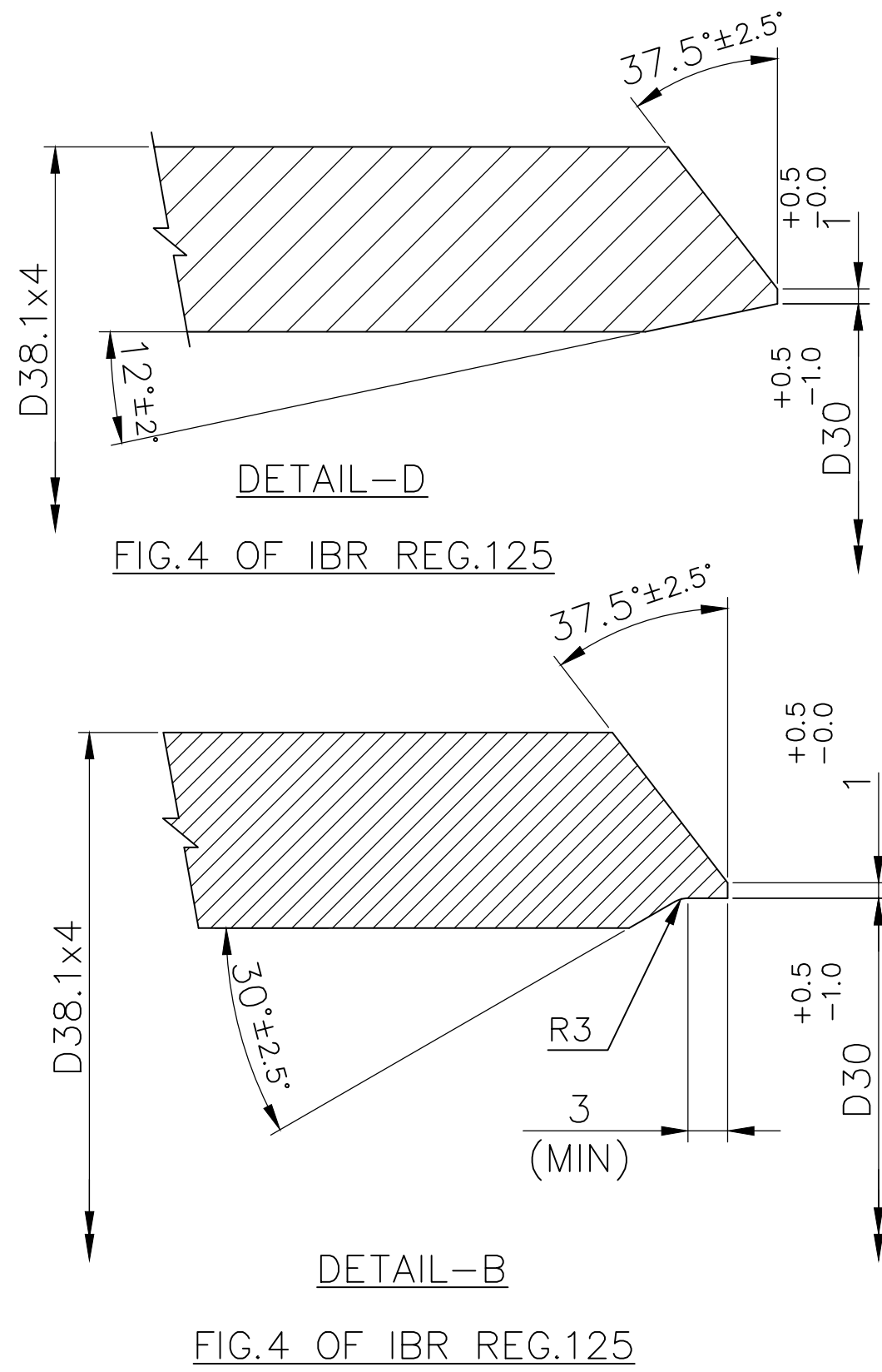




SECTION-AA

NOTES: -

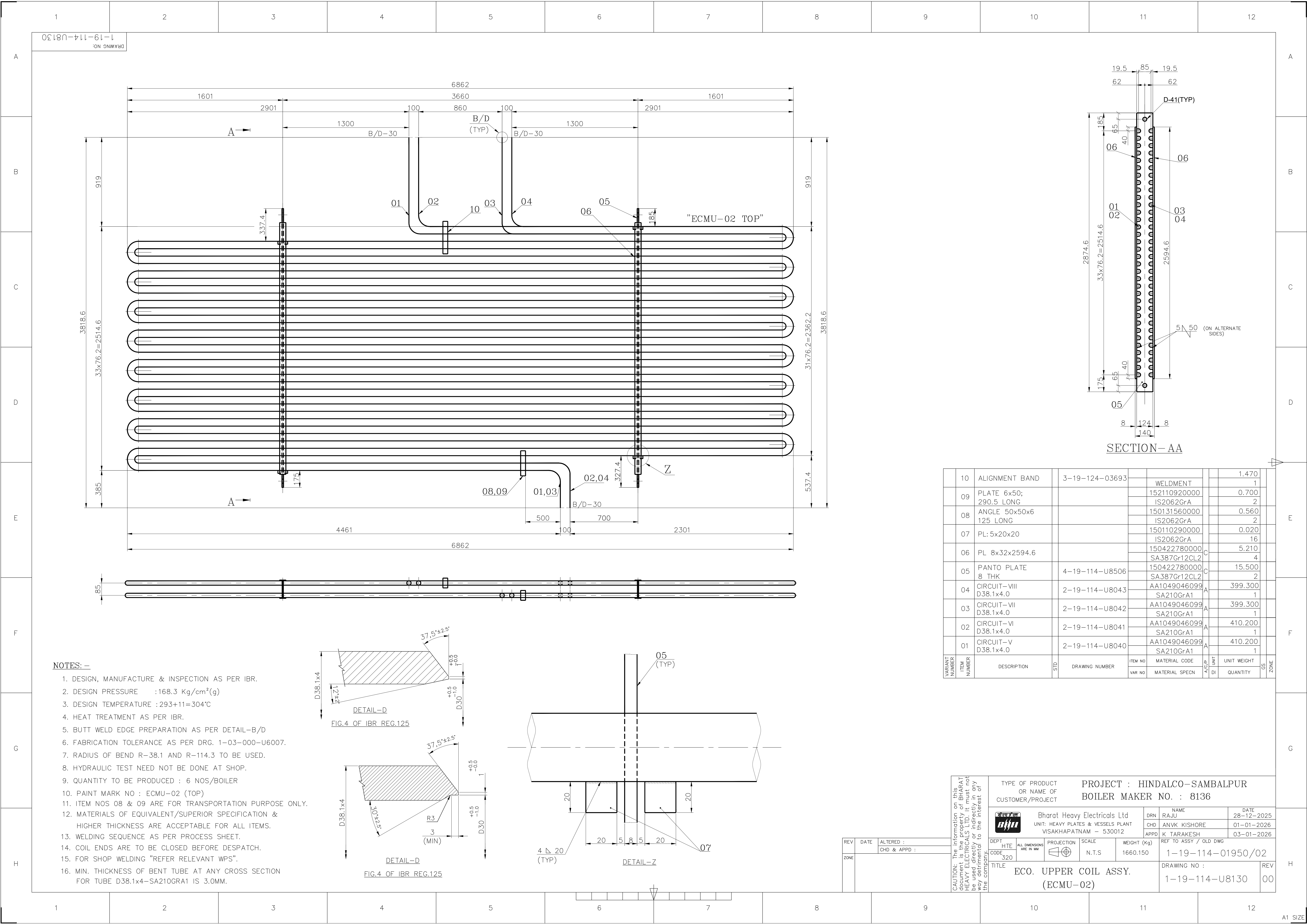
- DESIGN, MANUFACTURE & INSPECTION AS PER IBR.
- DESIGN PRESSURE :168.3 Kg/cm²(g)
- DESIGN TEMPERATURE :293+11=304°C
- HEAT TREATMENT AS PER IBR.
- BUTT WELD EDGE PREPARATION AS PER DETAIL-B/D
- FABRICATION TOLERANCE AS PER DRG. 1-03-000-U6007.
- RADIUS OF BEND R=38.1 AND R=114.3 TO BE USED.
- HYDRAULIC TEST NEED NOT BE DONE AT SHOP.
- QUANTITY TO BE PRODUCED : 61 NOS/BOILER
- PAINT MARK NO : ECMU-01 (TOP)
- MATERIALS OF EQUIVALENT/SUPERIOR SPECIFICATION & HIGHER THICKNESS ARE ACCEPTABLE FOR ALL ITEMS.
- WELDING SEQUENCE AS PER PROCESS SHEET.
- COIL ENDS ARE TO BE CLOSED BEFORE DESPATCH.
- FOR SHOP WELDING "REFER RELEVANT WPS".
- MIN. THICKNESS OF BENT TUBE AT ANY CROSS SECTION FOR TUBE D38.1x4-SA210GRA1 IS 3.0MM.



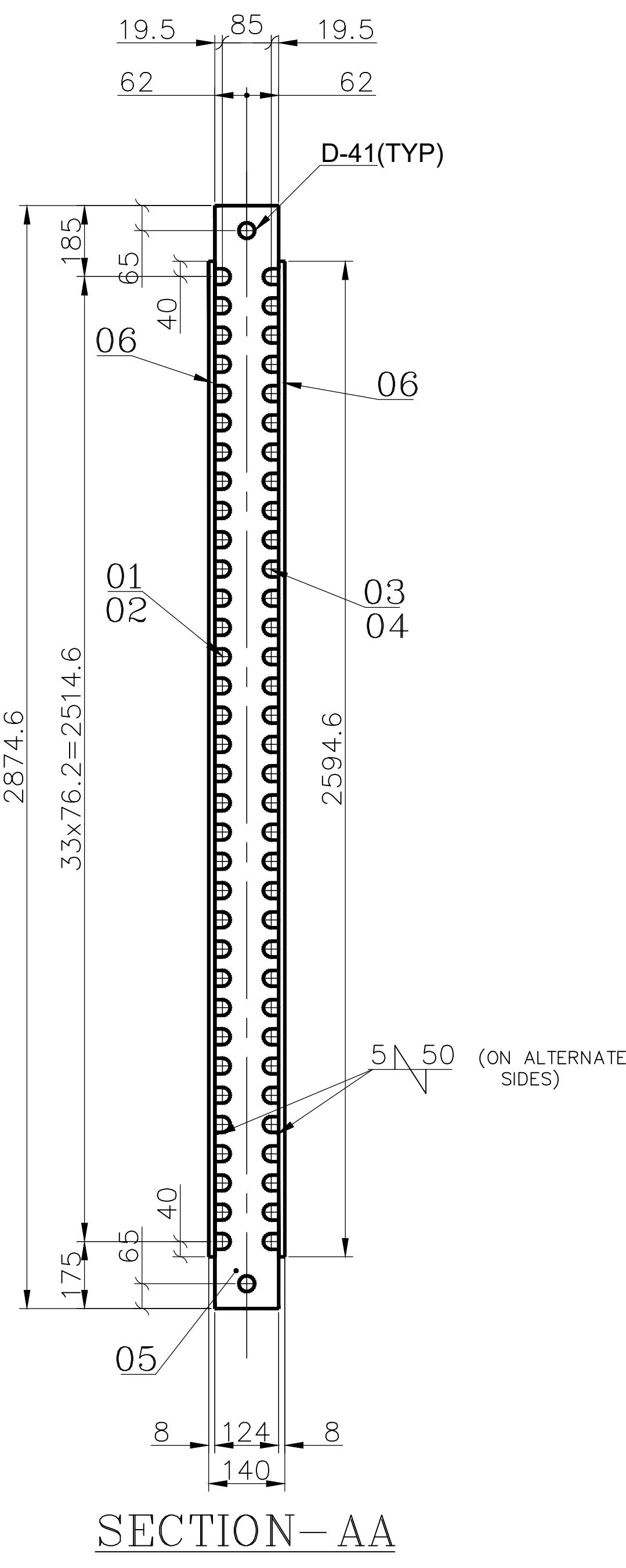
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO VAR NO	MATERIAL CODE MATERIAL SPECN	A/G/P DI	UNIT QUANTITY	UNIT WEIGHT KG	ZONE
	08	ALIGNMENT BAND		3-19-124-03693		WELDMENT		1.470	1	
	07	PL: 5x20x20				150110290000		0.020	4	
						IS2062GrA		16		
	06	PL 8x32x2594.6				150422780000	C	5.210	4	
						SA387Gr12CL2		15.500	2	
	05	PANTO PLATE 8 THK		4-19-114-U8506		150422780000	C	402.500	1	
	04	CIRCUIT-IV D38.1x4.0		2-19-114-U8039		AA1049046099	A	410.200	1	
						SA210GrA1		410.200	1	
	03	CIRCUIT-III D38.1x4.0		2-19-114-U8038		AA1049046099	A	410.200	1	
						SA210GrA1		410.200	1	
	02	CIRCUIT-II D38.1x4.0		2-19-114-U8037		AA1049046099	A	410.200	1	
						SA210GrA1		410.200	1	
	01	CIRCUIT-I D38.1x4.0		2-19-114-U8036		AA1049046099	A	410.200	1	
						SA210GrA1		410.200	1	

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used for any purpose or in any way without the written consent of the company.	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		PROJECT : HINDALCO-SAMBALPUR BOILER MAKER NO. : 8136		
	DEPT HTE	ALL DIMENSIONS ARE IN MM	PROJECTION	SCALE	WEIGHT (Kg)
	CODE 320			N.T.S	1679.030
	TITLE		ECO. UPPER COIL ASSY. (ECMU-01)		
	DRAWING NO : 1-19-114-U8129		REV 00		

REV 01	DATE	ALTERED : CHD & APPD :
ZONE		



- NOTES: —
1. DESIGN, MANUFACTURE & INSPECTION AS PER IBR.
 2. DESIGN PRESSURE :168.3 Kg/cm²(g)
 3. DESIGN TEMPERATURE :293+11=304°C
 4. HEAT TREATMENT AS PER IBR.
 5. BUTT WELD EDGE PREPARATION AS PER DETAIL-B/D
 6. FABRICATION TOLERANCE AS PER DRG. 1-03-000-U6007.
 7. RADIUS OF BEND R-38.1 AND R-114.3 TO BE USED.
 8. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.
 9. QUANTITY TO BE PRODUCED : 6 NOS/BOILER
 10. PAINT MARK NO : ECMU-02 (TOP)
 11. ITEM NOS 08 & 09 ARE FOR TRANSPORTATION PURPOSE ONLY.
 12. MATERIALS OF EQUIVALENT/SUPERIOR SPECIFICATION & HIGHER THICKNESS ARE ACCEPTABLE FOR ALL ITEMS.
 13. WELDING SEQUENCE AS PER PROCESS SHEET.
 14. COIL ENDS ARE TO BE CLOSED BEFORE DESPATCH.
 15. FOR SHOP WELDING "REFER RELEVANT WPS".
 16. MIN. THICKNESS OF BENT TUBE AT ANY CROSS SECTION FOR TUBE D38.1x4-SA210GRA1 IS 3.0MM.



10	ALIGNMENT BAND	3-19-124-03693					1.470		
				WELDMENT			1		
09	PLATE 6x50; 290.5 LONG			152110920000			0.700		
				IS2062GrA			2		
08	ANGLE 50x50x6 125 LONG			150131560000			0.560		
				IS2062GrA			2		
07	PL: 5x20x20			150110290000			0.020		
				IS2062GrA			16		
06	PL 8x32x2594.6			150422780000	C		5.210		
				SA387Gr12CL2			4		
05	PANTO PLATE 8 THK	4-19-114-U8506		150422780000	C		15.500		
				SA387Gr12CL2			2		
04	CIRCUIT-VIII D38.1x4.0	2-19-114-U8043		AA1049046099	A		399.300		
				SA210GrA1			1		
03	CIRCUIT-VII D38.1x4.0	2-19-114-U8042		AA1049046099	A		399.300		
				SA210GrA1			1		
02	CIRCUIT-VI D38.1x4.0	2-19-114-U8041		AA1049046099	A		410.200		
				SA210GrA1			1		
01	CIRCUIT-V D38.1x4.0	2-19-114-U8040		AA1049046099	A		410.200		
				SA210GrA1			1		
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO VAR NO	MATERIAL CODE MATERIAL SPECN	UNIT DI	UNIT WEIGHT QUANTITY	GS ZONE

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT				PROJECT : HINDALCO-SAMBALPUR BOILER MAKER NO. : 8136			
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used, copied or otherwise reproduced without the written permission of the company.	Bharat Heavy Electricals Ltd		DRN	NAME	DATE		
	UNIT: HEAVY PLATES & VESSELS PLANT		CHD	ANVK KISHORE	01-01-2026		
	VISAKHAPATNAM - 530012		APPD	K TARAKESH	03-01-2026		
			REF TO ASSY / OLD DWG				
DEPT HTE	ALL DIMENSIONS ARE IN MM	PROJECTION	SCALE	WEIGHT (Kg)			
CODE 320			N.T.S	1660.150	1-19-114-01950/02		
TITLE ECO. UPPER COIL ASSY. (ECMU-02)					DRAWING NO : 1-19-114-U8130		REV 00

REV	DATE	ALTERED : CHD & APPD :
ZONE		

Technical drawing of a cable tray assembly, showing top and side views with dimensions and labels.

Top View Dimensions:

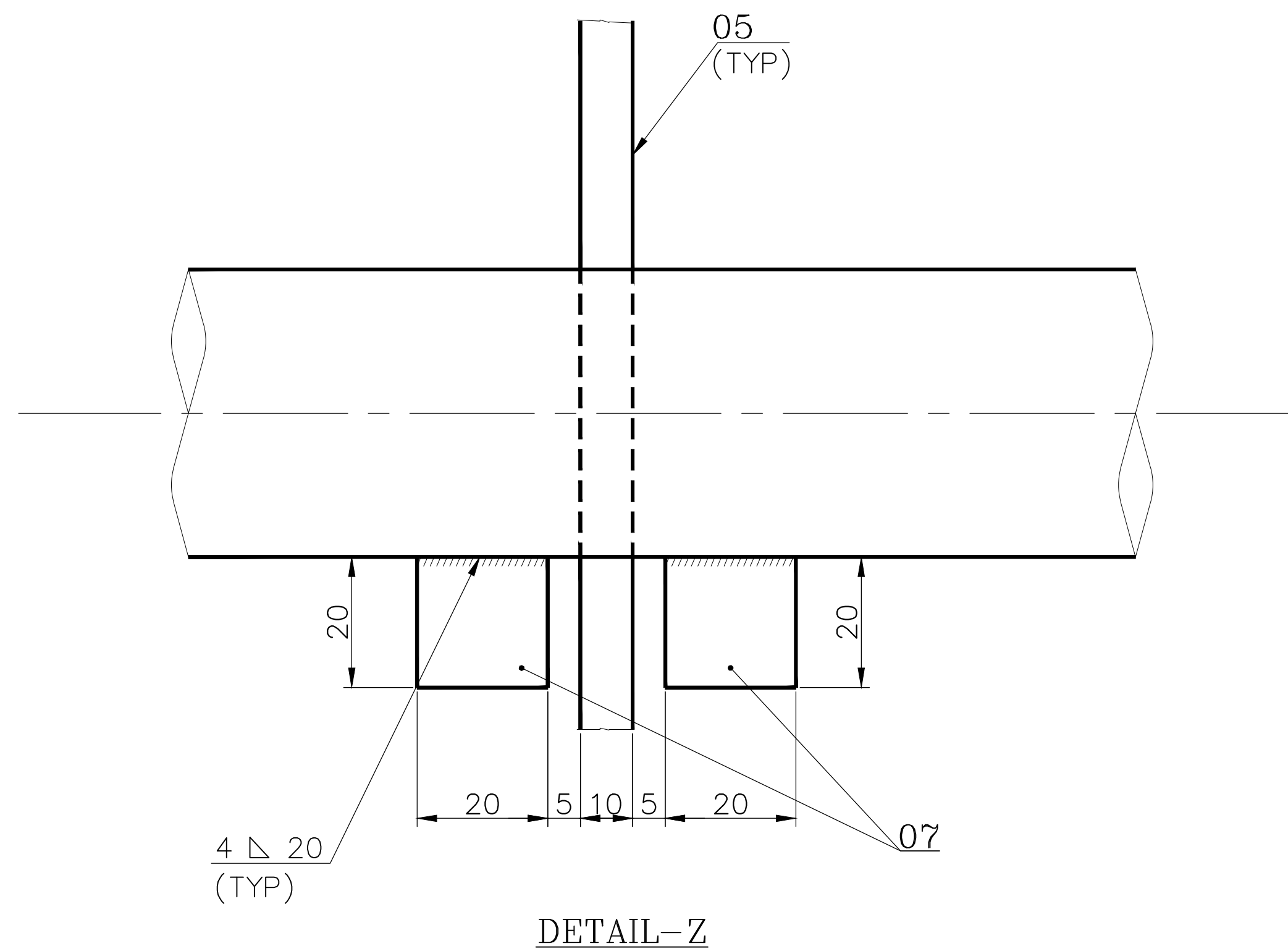
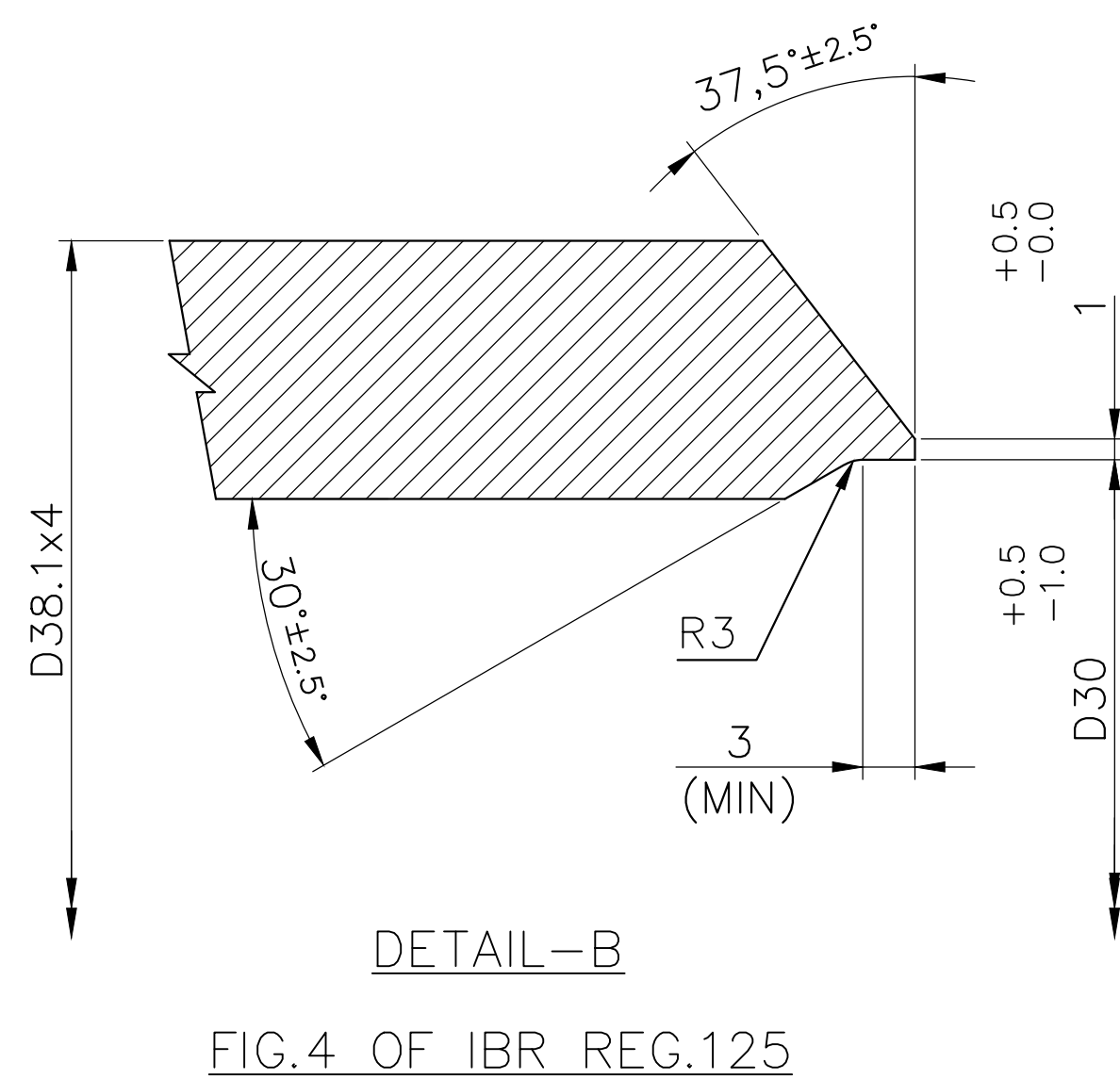
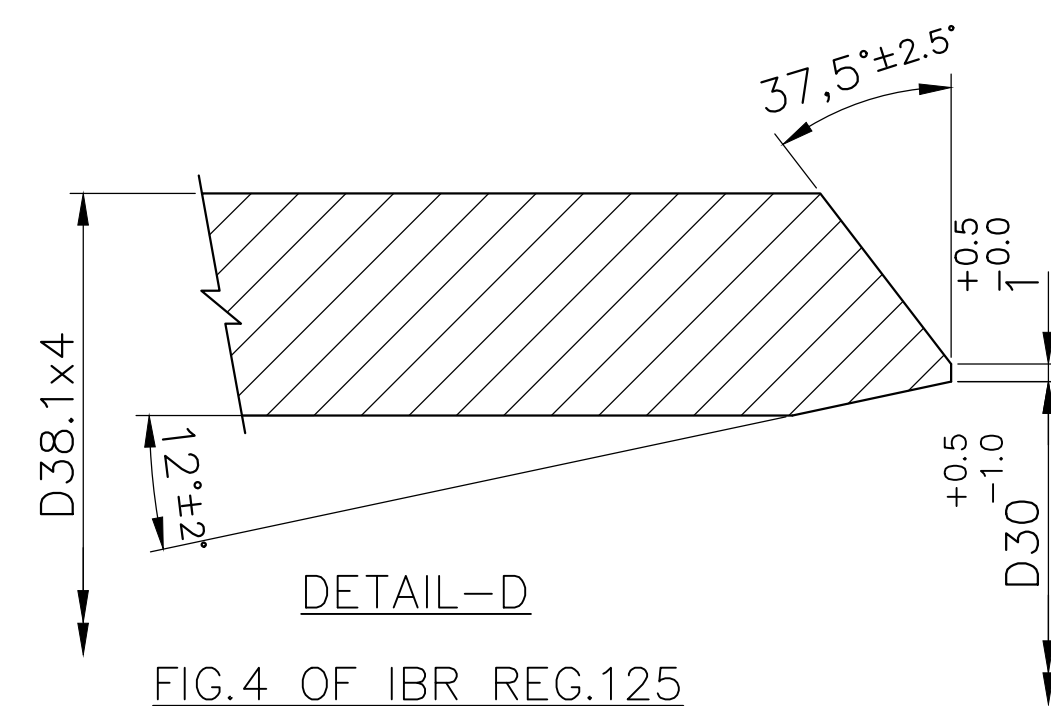
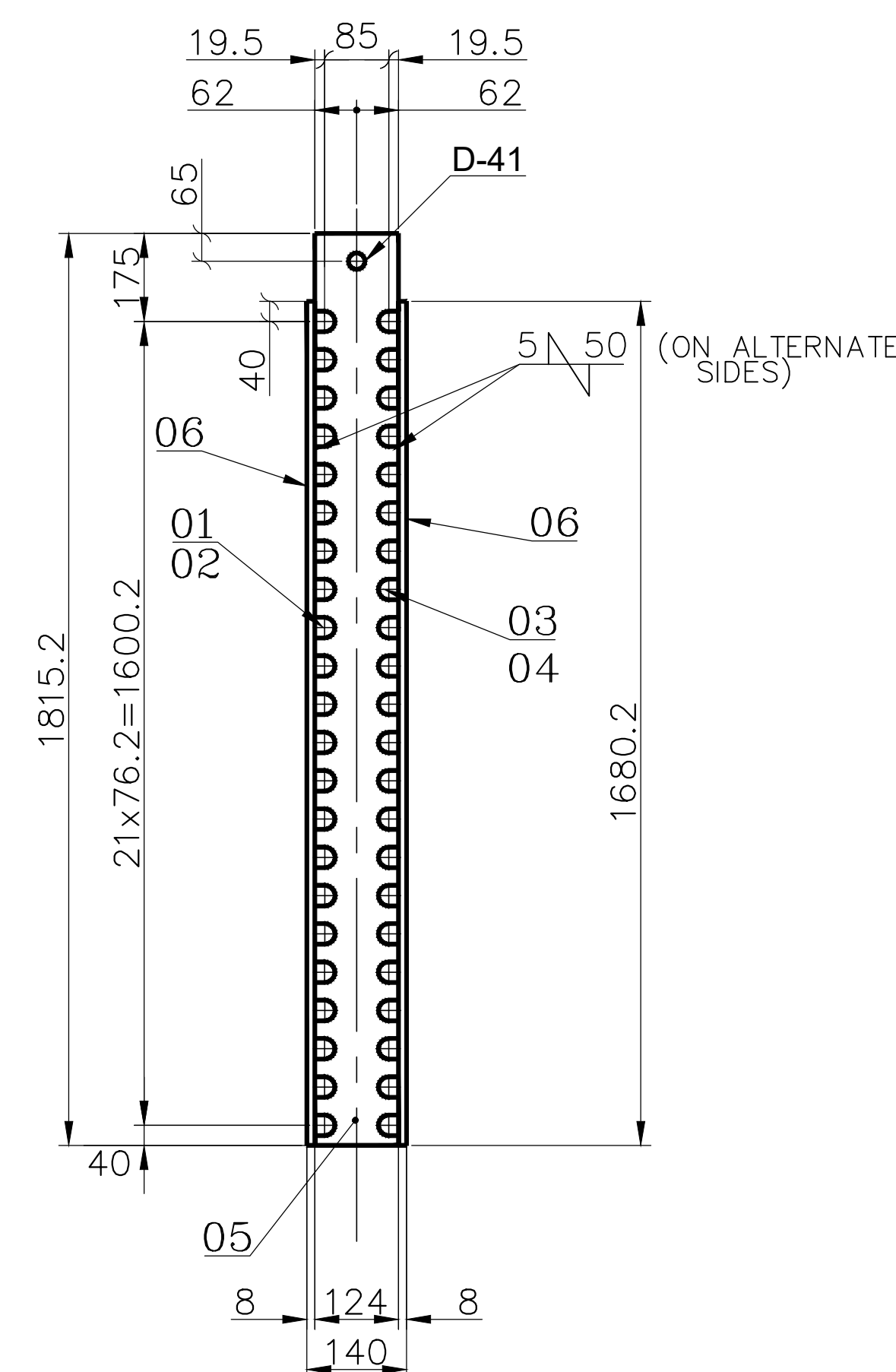
- Overall width: 6862
- Distance from left edge to first vertical support: 1601
- Distance between vertical supports: 3660
- Distance from second vertical support to right edge: 1601
- Overall length: 5961
- Distance from right edge to end of cable tray: 801
- Distance from end of cable tray to vertical support: 700
- Distance from vertical support to end of cable tray: 100

Side View Dimensions:

- Overall height: 2235.2
- Height of cable tray: 537.4
- Height of vertical support: 1487.8
- Height of cable tray from base: 402.4
- Height of vertical support from base: 40
- Height of cable tray from base: 76.2

Labels and Callouts:

- A → I
- 05
- 06
- "ECML-01 TOP"
- B/D-30
- B/D (TYP)
- 08
- 02-R
- 01-R
- B/D-30(TYP)
- 03-L
- 04-L
- Z



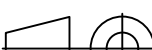
08	ALIGNMENT BAND	3-19-124-03692		WELDMENT			1.470		
07	PL: 5x20x20			150110290000			0.016		
				IS2062GrA			16		
06	PL 8x32x1680.2			150422780000	C		3.380		
				SA387Gr12CL2			4		
05	PANTO PLATE 8 THK	4-19-124-U8507		150422780000	C		11.000		
				SA387Gr12CL2			2		
04	CIRCUIT-IV D38.1x4.0	2-19-124-U8047		AA1049046099	A		251.700		
				SA210GrA1			1		
03	CIRCUIT-III D38.1x4.0	2-19-124-U8046		AA1049046099	A		251.870		
				SA210GrA1			1		
02	CIRCUIT-II D38.1x4.0	2-19-124-U8045		AA1049046099	A		253.660		
				SA210GrA1			1		
01	CIRCUIT-I D38.1x4.0	2-19-124-U8044		AA1049046099	A		253.850		
				SA210GrA1			1		
ITEM NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO	MATERIAL CODE	A/C/P	UNIT WEIGHT	ZONE
					VAR NO	MATERIAL SPECN	DI	QUANTITY	

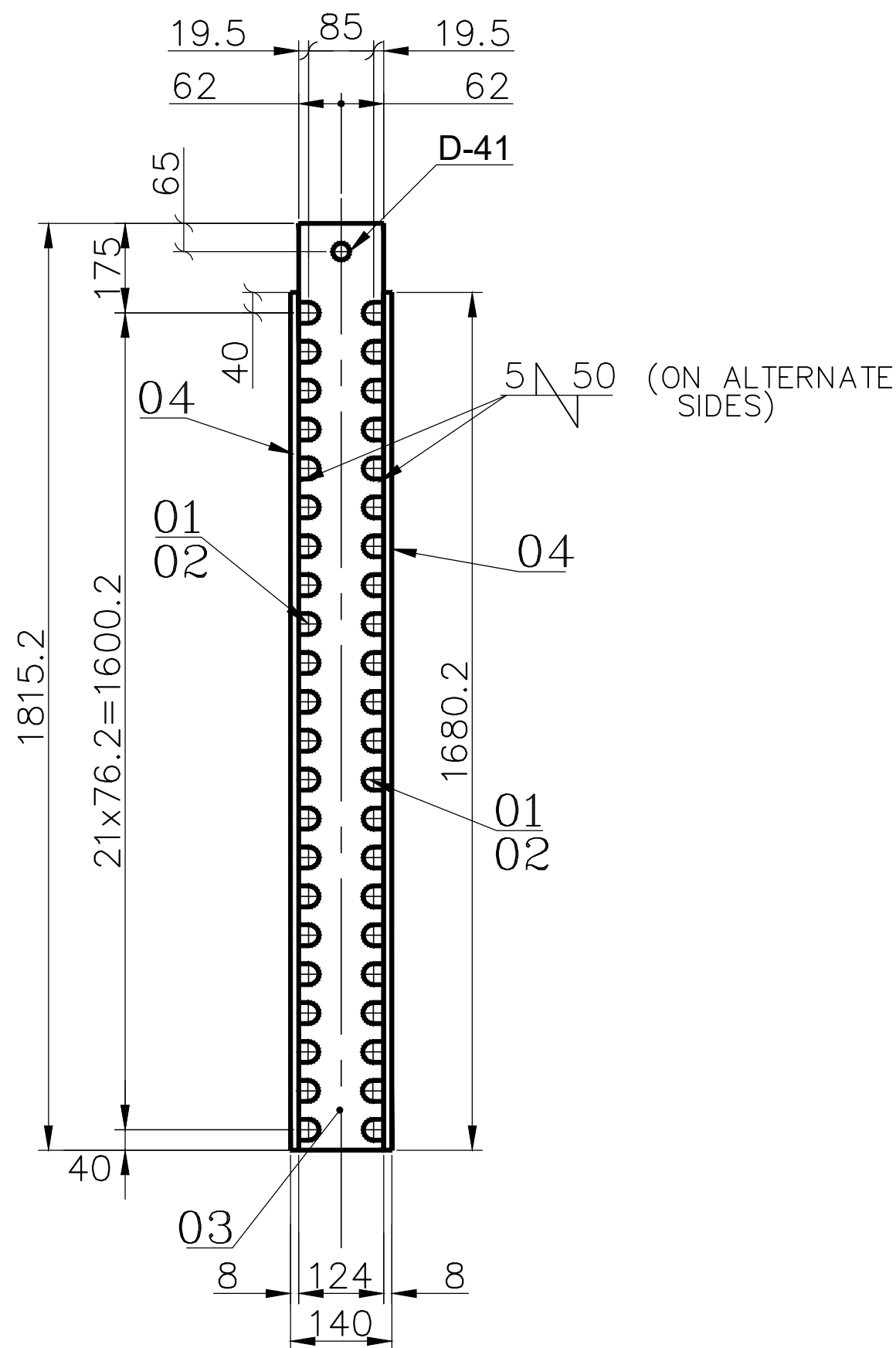
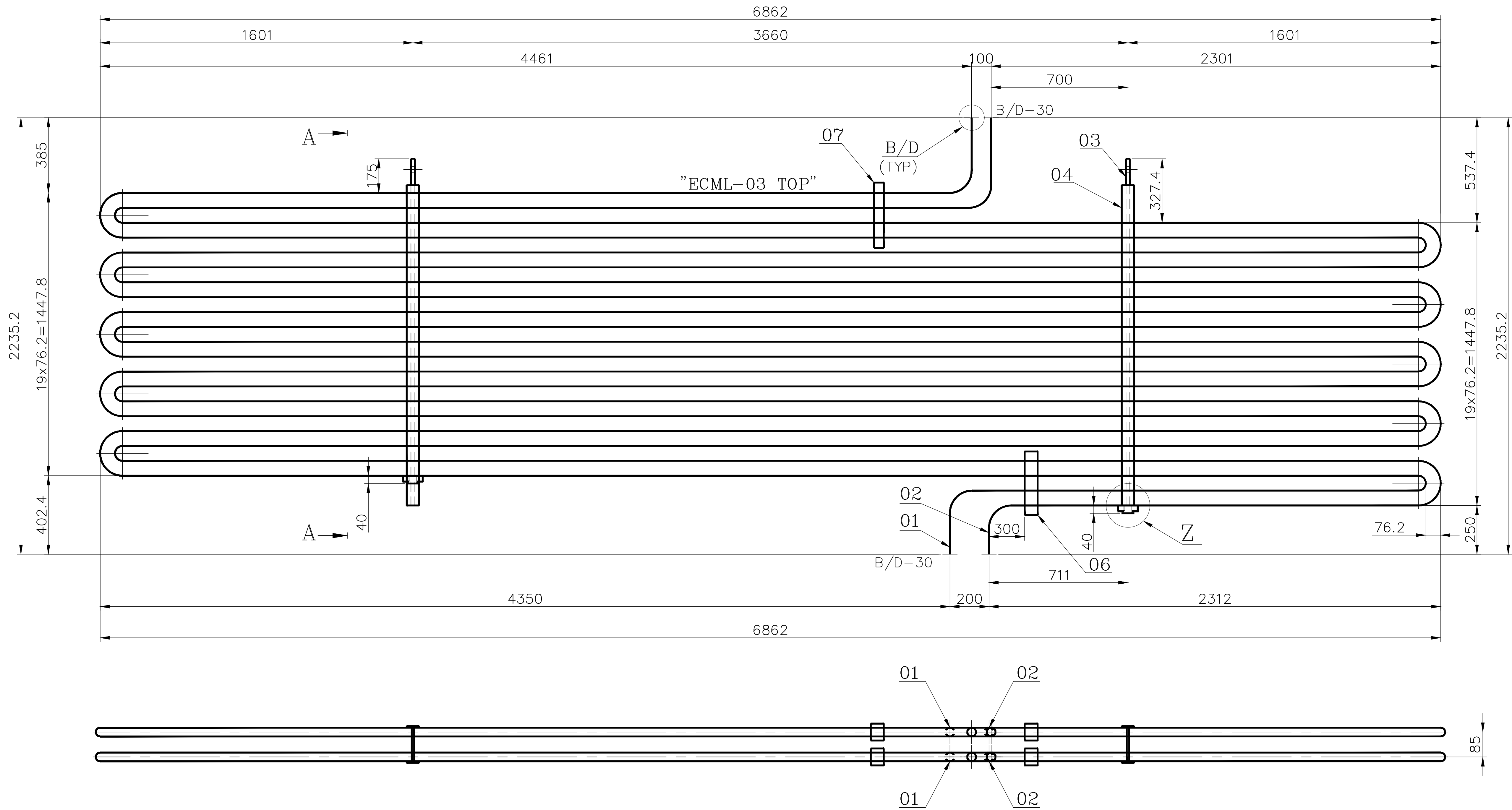
NOTES: —

1. DESIGN, MANUFACTURE & INSPECTION AS PER IBR.
2. DESIGN PRESSURE : 168.3 Kg/cm²(g)
3. DESIGN TEMPERATURE : 293+11=304°C
4. HEAT TREATMENT AS PER IBR.
5. BUTT WELD EDGE PREPARATION AS PER DETAIL-B/D
6. FABRICATION TOLERANCE AS PER DRG. 1-03-000-U6007.
7. RADIUS OF BEND R-38.1 AND R-114.3 TO BE USED.
8. HYDRAULIC TEST NEED NOT BE DONE AT SHOP.
9. QUANTITY TO BE PRODUCED : 1 NO/BOILER
10. PAINT MARK NO : ECML-01 (TOP)
11. ITEM NOS 08 & 09 ARE FOR TRANSPORTATION PURPOSE ONLY.
12. MATERIALS OF EQUIVALENT/SUPERIOR SPECIFICATION & HIGHER THICKNESS ARE ACCEPTABLE FOR ALL ITEMS.
13. WELDING SEQUENCE AS PER PROCESS SHEET.
14. COIL ENDS ARE TO BE CLOSED BEFORE DESPATCH.
15. FOR SHOP WELDING "REFER RELEVANT WPS".
16. MIN. THICKNESS OF BENT TUBE AT ANY CROSS SECTION FOR TUBE D38.1x4-SA210GRA1 IS 3.0MM.

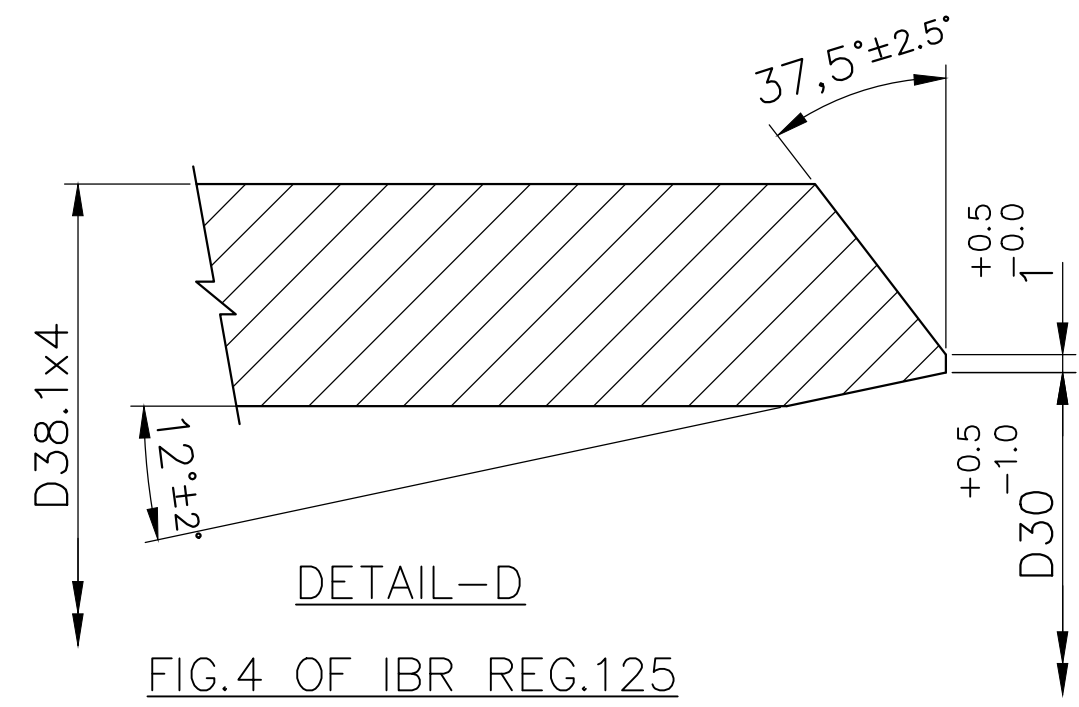
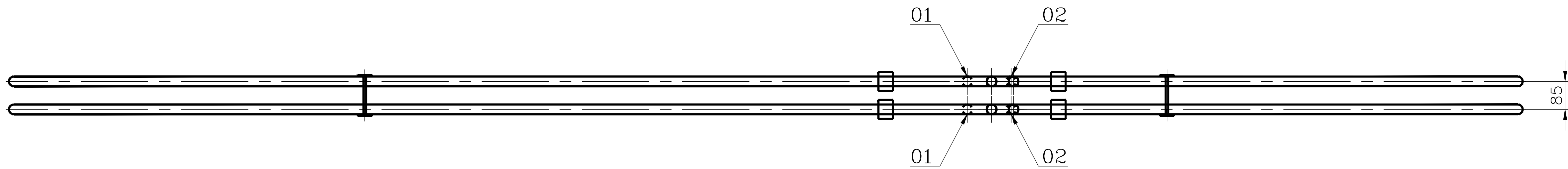
REV	DATE	ALTERED :
		CHD & APPD :
ZONE		

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

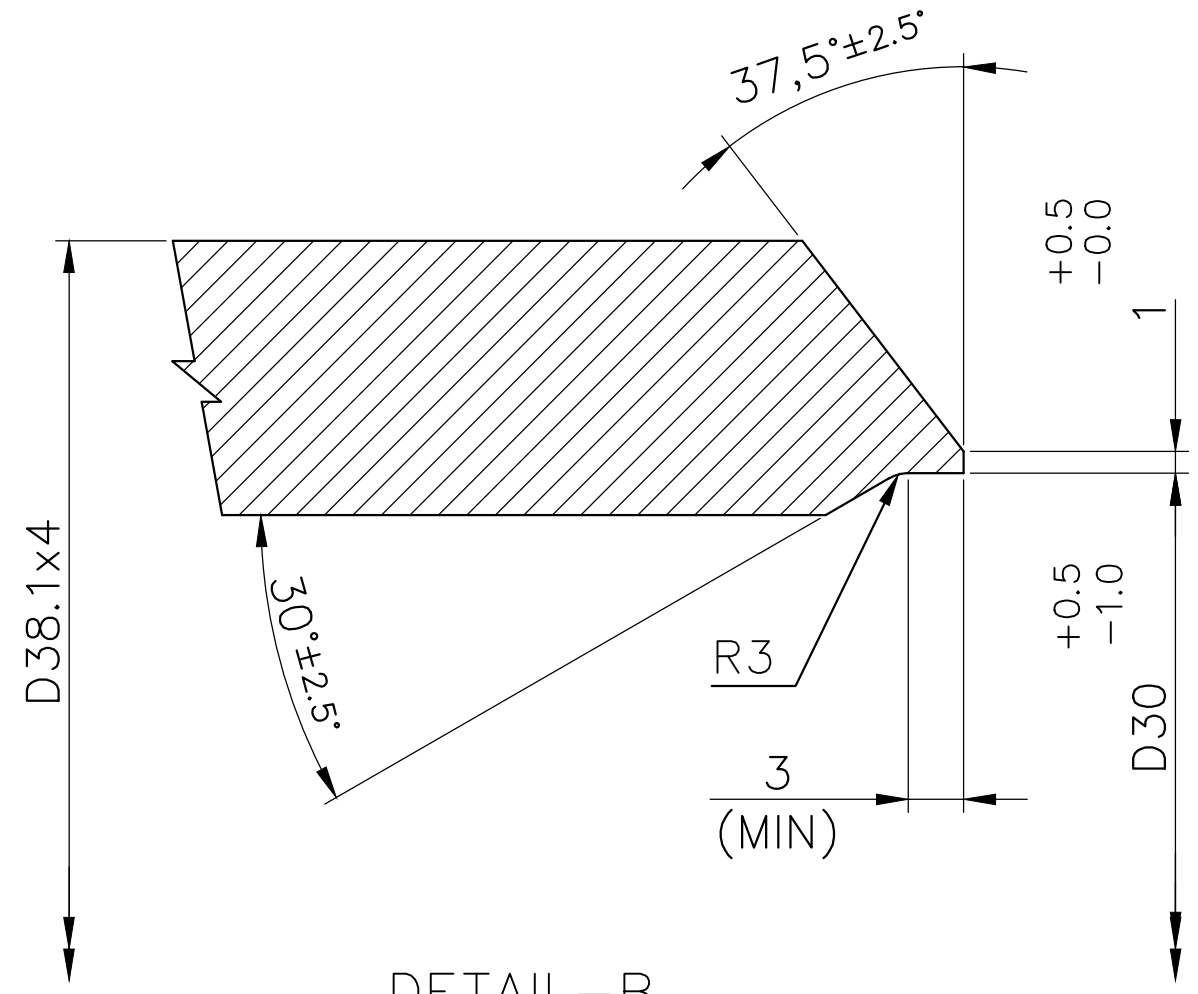
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		PROJECT : HINDALCO-SAMBALPUR BOILER MAKER NO. : 8136			
 Bharat Heavy Electricals Ltd UNIT: HEAVY PLATES & VESSELS PLANT VISAKHAPATNAM - 530012		DRN	NAME RAJU	DATE 02-01-2026	
		CHD	ANVK KISHORE	06-01-2026	
		APPD	K TARA KESH	08-01-2026	
		REF TO ASSY / OLD DWG			
DEPT HTE	ALL DIMENSIONS ARE IN MM	PROJECTION 	SCALE N.T.S	WEIGHT (Kg) 1048.326	1-19-124-01942/01
CODE 320	TITLE ECO.LOWER COIL ASSY. (ECML-01)				DRAWING NO : 1-19-124-U8131
					REV 00



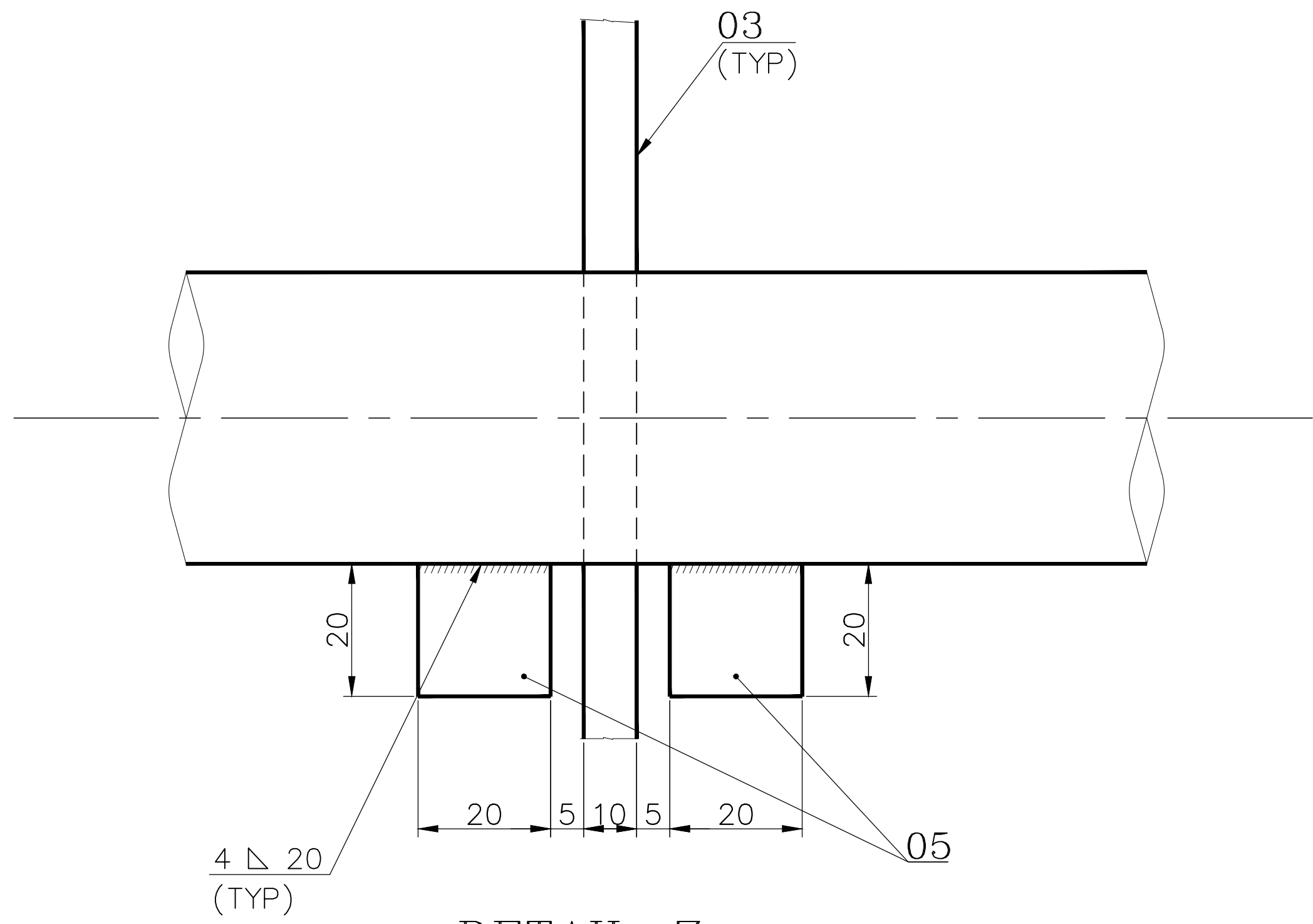
SECTION-AA



DETAIL-D
FIG.4 OF IBR REG.125



DETAIL-B
FIG.4 OF IBR REG.125



DETAIL-Z

NOTES: -

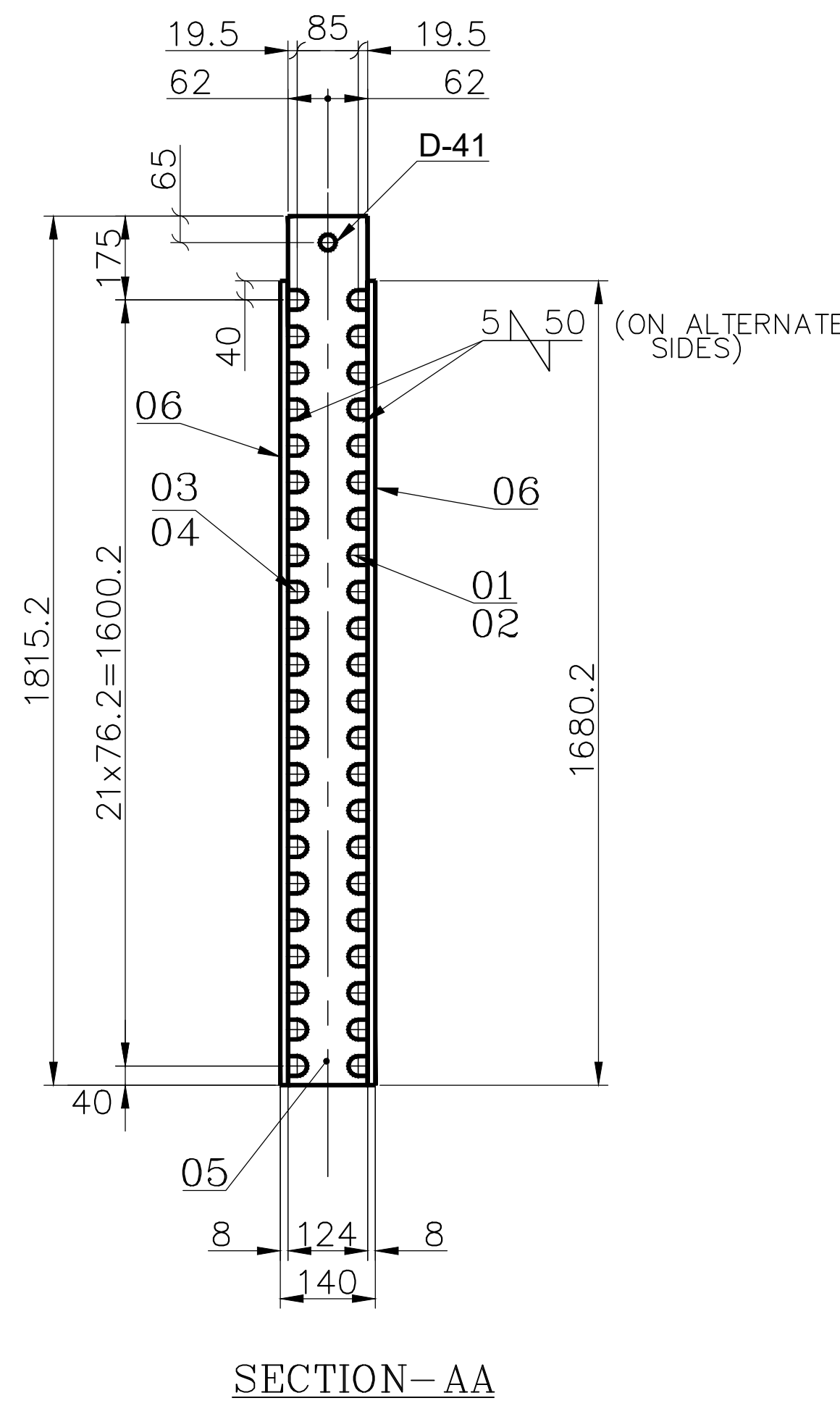
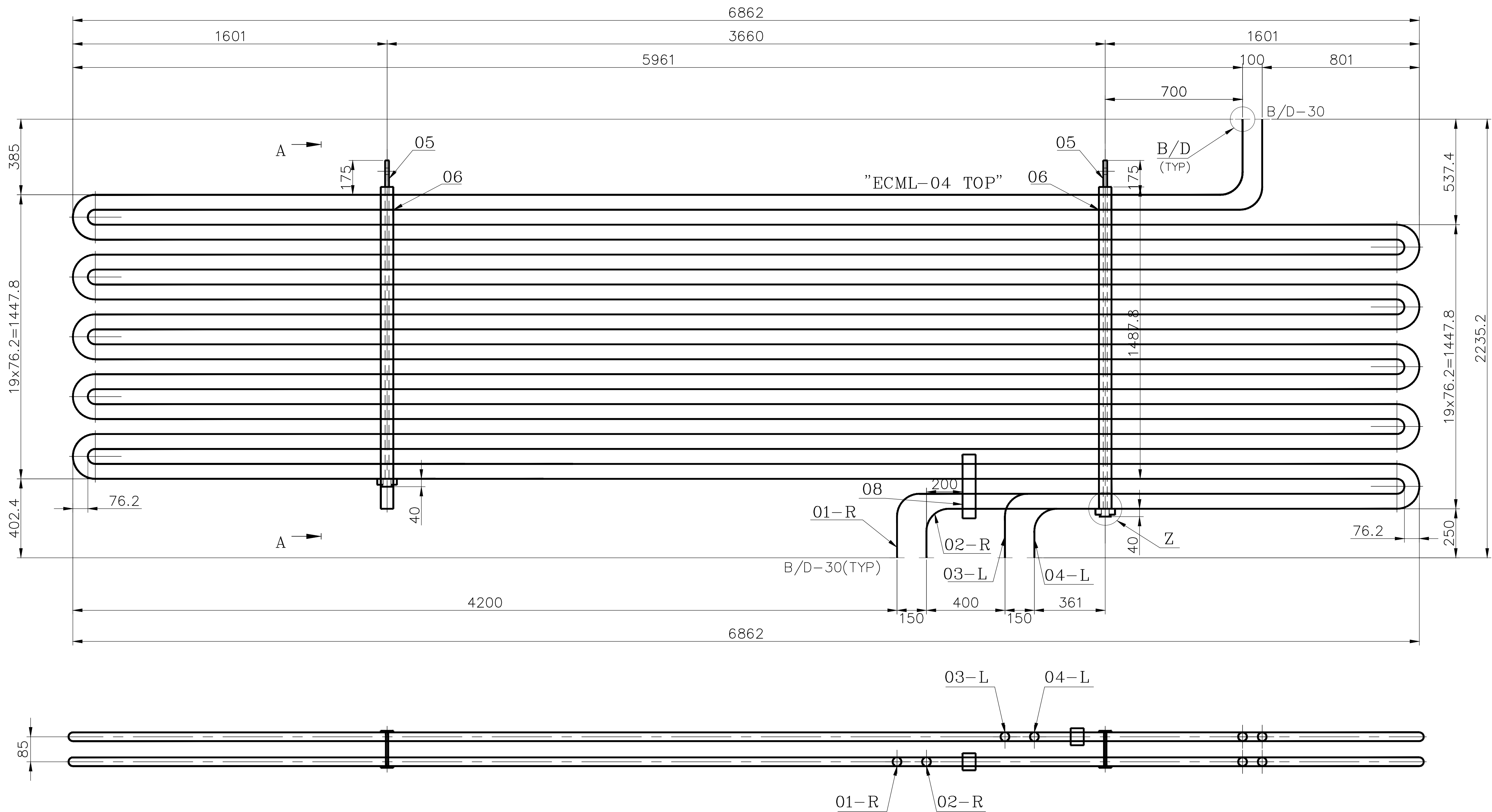
- DESIGN, MANUFACTURE & INSPECTION AS PER IBR.
- DESIGN PRESSURE :168.3 Kg/cm²(g)
- DESIGN TEMPERATURE :293+11=304°C
- HEAT TREATMENT AS PER IBR.
- BUTT WELD EDGE PREPARATION AS PER DETAIL-B/D
- FABRICATION TOLERANCE AS PER DRG. 1-03-000-U6007.
- RADIUS OF BEND R-38.1 AND R-114.3 TO BE USED.
- HYDRAULIC TEST NEED NOT BE DONE AT SHOP.
- QUANTITY TO BE PRODUCED : 6 NOS/BOILER
- PAINT MARK NO : ECML-03 (TOP)
- ITEM NOS 08 & 09 ARE FOR TRANSPORTATION PURPOSE ONLY.
- MATERIALS OF EQUIVALENT/SUPERIOR SPECIFICATION & HIGHER THICKNESS ARE ACCEPTABLE FOR ALL ITEMS.
- WELDING SEQUENCE AS PER PROCESS SHEET.
- COIL ENDS ARE TO BE CLOSED BEFORE DESPATCH.
- FOR SHOP WELDING "REFER RELEVANT WPS".
- MIN. THICKNESS OF BENT TUBE AT ANY CROSS SECTION FOR TUBE D38.1x4-SA210GRA1 IS 3.0MM.

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO VAR NO	MATERIAL CODE MATERIAL SPECN	A/G/P DI	UNIT QUANTITY	UNIT WEIGHT GS	ZONE
	07	ALIGNMENT BAND	3-19-124-03693			WELDMENT		1.470 2		
	06	ALIGNMENT BAND	3-19-124-03692			WELDMENT		1.470 2		
	05	PL: 5x20x20				150110290000 IS2062GrA		0.016 16		
	04	PL 8x32x1680.2				150422780000 SA387Gr12CL2	C	3.380 4		
	03	PANTO PLATE 8 THK	4-19-124-U8507			150422780000 SA387Gr12CL2	C	11.000 2		
	02	CIRCUIT-VIII D38.1x4.0	2-19-124-U8051			AA1049046099 SA210GrA1	A	247.600 2		
	01	CIRCUIT-VII D38.1x4.0	2-19-124-U8050			AA1049046099 SA210GrA1	A	247.950 2		

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		PROJECT : HINDALCO-SAMBALPUR BOILER MAKER NO. : 8136				
			Bharat Heavy Electricals Ltd UNIT: HEAVY PLATES & VESSELS PLANT VISAKHAPATNAM - 530012		DRN RAJU	DATE 02-01-2026	
			CHD ANVK KISHORE		06-01-2026		
					APPD K TARAKESH		08-01-2026
	DEPT HTE	ALL DIMENSIONS ARE IN MM	PROJECTION 	SCALE N.T.S	WEIGHT (Kg) 1032.756	REF TO ASSY / OLD DWG 1-19-124-01944/01	
	CODE 320	TITLE ECO.LOWER COIL ASSY. (ECML-03)				DRAWING NO : 1-19-124-U8133 REV 00	

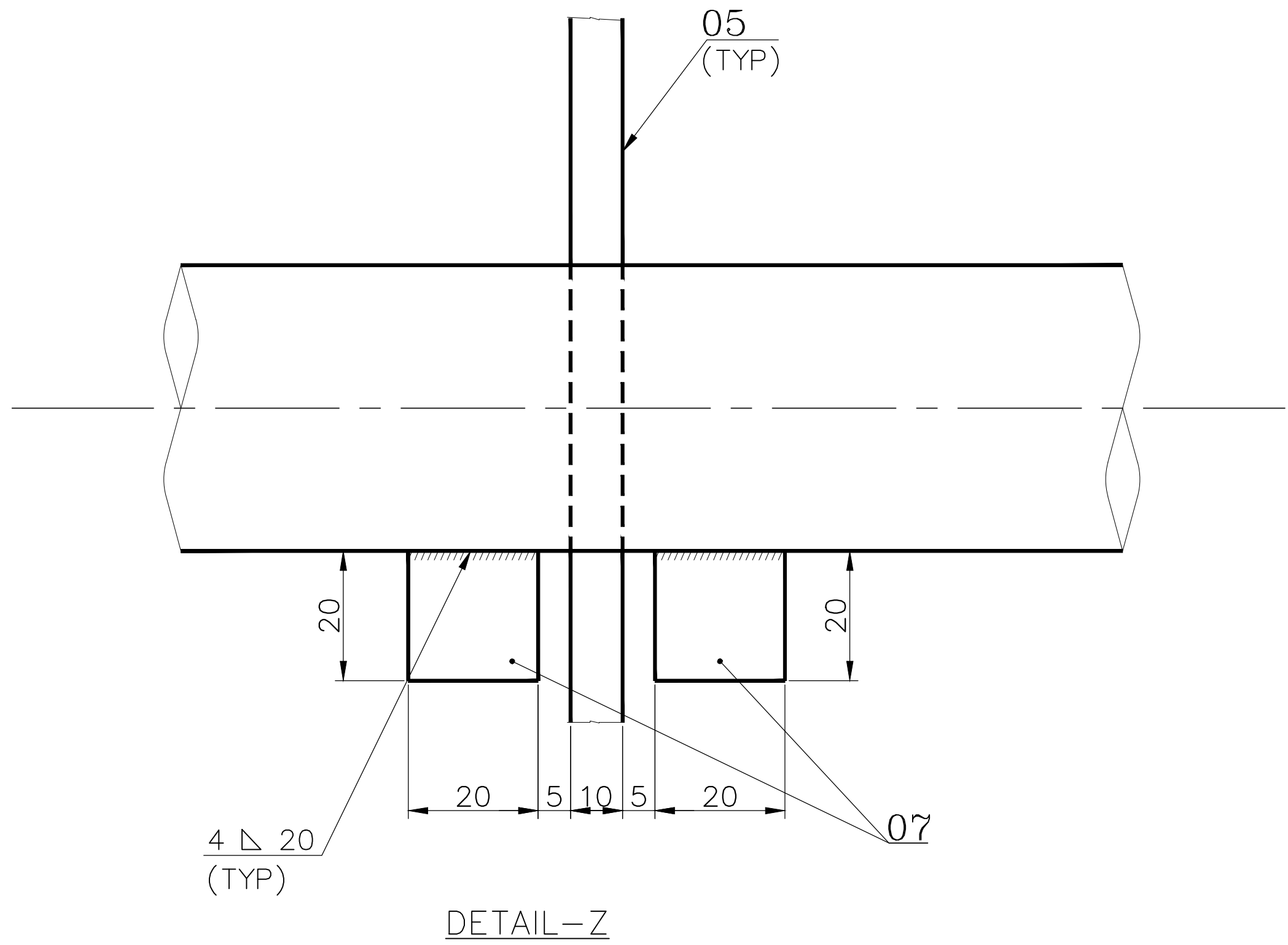
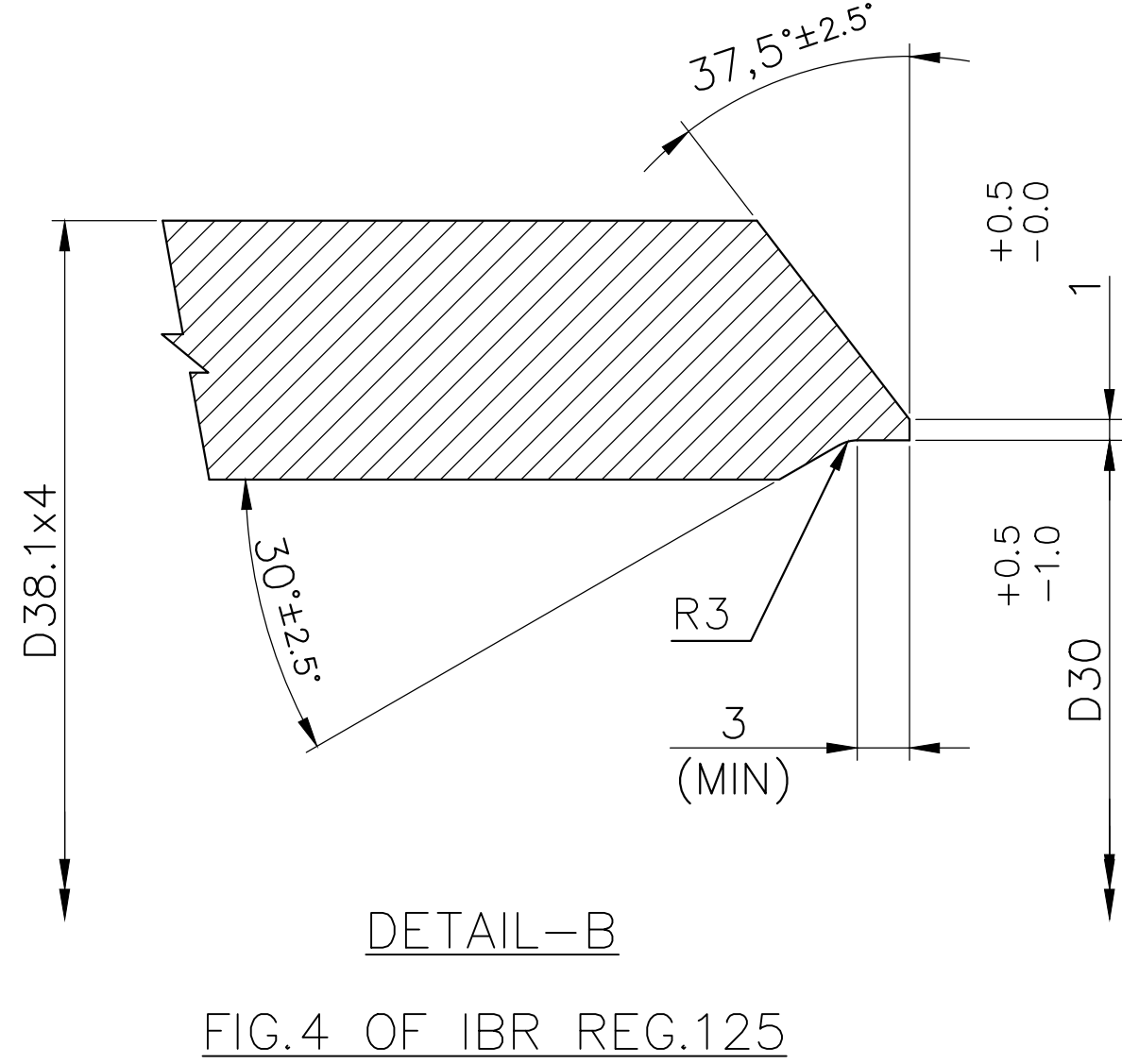
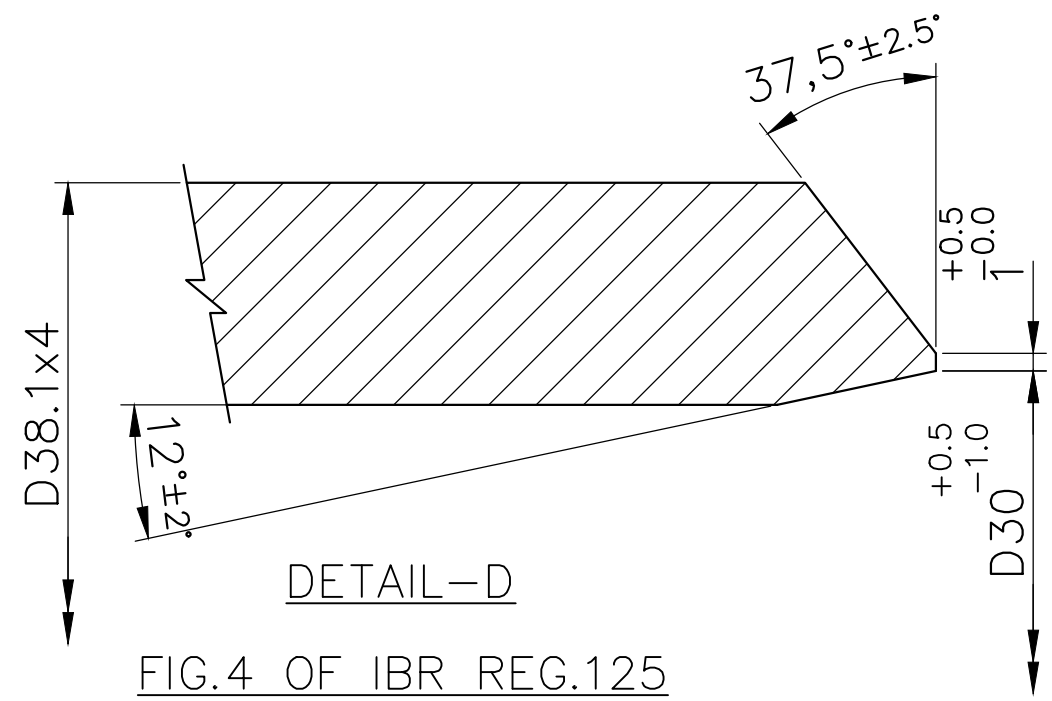
REV	DATE	ALTERED : CHD & APPD :
ZONE		

1-19-124-U8134
DRAWING NO.



NOTES: -

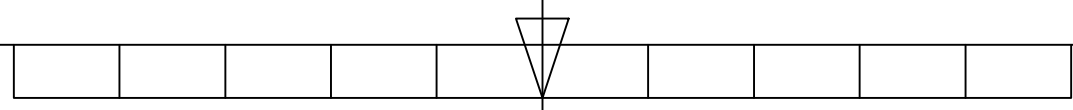
- DESIGN, MANUFACTURE & INSPECTION AS PER IBR.
- DESIGN PRESSURE :168.3 Kg/cm²(g)
- DESIGN TEMPERATURE :293+11=304°C
- HEAT TREATMENT AS PER IBR.
- BUTT WELD EDGE PREPARATION AS PER DETAIL-B/D
- FABRICATION TOLERANCE AS PER DRG. 1-03-000-U6007.
- RADIUS OF BEND R-38.1 AND R-114.3 TO BE USED.
- HYDRAULIC TEST NEED NOT BE DONE AT SHOP.
- QUANTITY TO BE PRODUCED : 1 NO/BOILER
- PAINT MARK NO : ECML-04 (TOP)
- ITEM NOS 08 & 09 ARE FOR TRANSPORTATION PURPOSE ONLY.
- MATERIALS OF EQUIVALENT/SUPERIOR SPECIFICATION & HIGHER THICKNESS ARE ACCEPTABLE FOR ALL ITEMS.
- WELDING SEQUENCE AS PER PROCESS SHEET.
- COIL ENDS ARE TO BE CLOSED BEFORE DESPATCH.
- FOR SHOP WELDING "REFER RELEVANT WPS".
- MIN. THICKNESS OF BENT TUBE AT ANY CROSS SECTION FOR TUBE D38.1x4-SA210GRA1 IS 3.0MM.



	08	ALIGNMENT BAND	3-19-124-03692				1.470		
				WELDMENT			1		
	07	PL: 5x20x20		150110290000			0.016		
				IS2062GrA			16		
	06	PL 8x32x1680.2		150422780000	C		3.380		
				SA387Gr12CL2			4		
	05	PANTO PLATE 8 THK	4-19-124-U8507	150422780000	C		11.000		
				SA387Gr12CL2			2		
	04	CIRCUIT-IV D38.1x4.0	2-19-124-U8047	AA1049046099	A		251.700		
				SA210GrA1			1		
	03	CIRCUIT-III D38.1x4.0	2-19-124-U8046	AA1049046099	A		251.870		
				SA210GrA1			1		
	02	CIRCUIT-II D38.1x4.0	2-19-124-U8045	AA1049046099	A		253.660		
				SA210GrA1			1		
	01	CIRCUIT-I D38.1x4.0	2-19-124-U8044	AA1049046099	A		253.850		
				SA210GrA1			1		
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO VAR NO	MATERIAL CODE MATERIAL SPECN	A/G/P DI UNIT QUANTITY	UNIT WEIGHT	GS ZONE

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT			PROJECT : HINDALCO-SAMBALPUR BOILER MAKER NO. : 8136					
				Bharat Heavy Electricals Ltd UNIT: HEAVY PLATES & VESSELS PLANT VISAKHAPATNAM - 530012		DRN	NAME RAJU	DATE 02-01-2026	
						CHD	ANVK KISHORE	06-01-2026	
						APPD	K TARAKESH	08-01-2026	
	DEPT	HTE	ALL DIMENSIONS ARE IN MM	PROJECTION 	SCALE N.T.S	WEIGHT (Kg) 1048.326	REF TO ASSY / OLD DWG		
	CODE	320					1-19-124-01945/01		
	TITLE ECO.LOWER COIL ASSY. (ECML-04)						DRAWING NO : 1-19-124-U8134		REV 00

REV	DATE	ALTERED : CHD & APPD :
ZONE		





**BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT**

HEAT TREATMENT TECHNOLOGY SHEET		FORMING OPERATION HOT FORMING	
HT CYCLE NO.: H-050-2026		DATE: 11.05.2026	
S.O.NO. 8136(11-236)	PART NO.: 001-01-01, 001-01-04, 002-07-01, 002-07-04, 003-12-01, 003-12-04	PRINCIPLE DIMENSIONS (mm)	
PART NAME: COIL TUBES	QTY.: AS PER DRG.	O.D. 44.5	
DRG NO: 2-11-236-U8057, U8060, U8061 & U8064;		I.C.R. --- I.K.R. ----	
MATL SPEC.: SA213T11	PROJECT: M/s. HINDALCO Sambalpur	THICKNESS: 5.0 & 5.9	
CODE: AS PER DRAWING		INSPEC.: AS PER DRAWING	

OTHER DETAILS: 1) Cold forming of Tube to Radius 114.3 mm and subsequent forming operation to Radius 48 mm (Hot squeezing and sizing) as per drawing.

- I. COLD BENDING OF TUBE D44.5 TO FINAL RADIUS R114.3 AS PER DRAWING.
SR NOT REQUIRED AS PER CLAUSE 2.1, SQP: PP:08/09, BHEL TRICHY STANDARD

- II. SUBSEQUENT FORMING OPERATION (HOT SQUEEZING AND SIZING TO RADIUS 48):
 - a) Loading Temperature(°C) : < 300
 - b) Rate of heating (°C/hr) : 220 MAX.
 - c) Holding temperature(°C) : 910 ±10
 - d) Minimum soaking time : 15 minutes
 - e) maximum soaking time : 30 minutes

- III. HEAT TREATMENT AFTER HOT SQUEEZING AND SIZING:
SR NOT REQUIRED AS PER CLAUSE 2.1, SQP: PP:08/09, BHEL TRICHY STANDARD

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

APPROVED BY:


ENGINEER. (WT) 11/05/26

CC TO: ENGINEER (PRDN-T)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM 530012
DEPARTMENT OF WELDING TECHNOLOGY

HEAT TREATMENT TECHNOLOGY SHEET				HT CYCLE NO.		H-053R1-2026	
				DATE		02-07-2026	
Name of the Equipment		S.O.NO.	Drawing no.			Customer	
SH HOR SPACED UPPER COIL + ATCH		8136 (11-236)	1-11-236-U8097 1-11-236-U8098 1-11-236-U8099			M/s. HINDALCO SAMBALPUR	
Part Name	Part No.	Material Spec.	Principle Dimensions (mm)			DESIGN PRESSURE	DESIGN TEMP.
---	DU001 TO DU003	SA210GRC SA387GR12CL2 IS2062E250 SA213T11	OD	ID	THK	As Per Drawing	As per Drawing
			44.5	---	5.0 / 5.9		

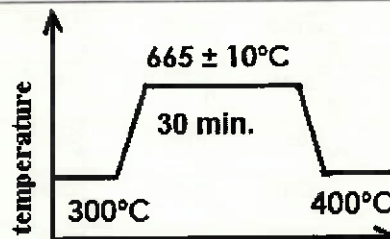
CODE: AS PER DRG.

INSPN. AGENCY: AS PER DRG.

NOMINAL WELD THICKNESS= 5.9 mm

TYPE OF HEAT TREATMENT

PWHT AFTER FORMATION OF COIL ASSEMBLY AND WELDING OF ALL ATTACHMENTS INCLUDING TUBES BUTT WELDING AS PER DRAWING.



- 1) Load the job on suitable supports in furnace at below 300°C.
- 2) Heat at the rate of 110°C/hr (Max.) up to the temperature of 665 ± 10°C.
- 3) Soak at 665 ± 10°C for 30 minutes
- 4) Cool in closed furnace at the rate of 140°C/hr (Max.) up to 400°C and controlled cooling rates are not applicable from 400°C.

GENERAL PRECAUTIONS:

- A. The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- B. Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- C. Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the vessel at bottom, centre And top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation. It shall be ensured that distance between any two thermocouples along with length of equipment is not more than 4.6 meters.
- D. Thermocouple (TC) shall be tack welded to the plate on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- E. Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- F. During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- G. Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

Issued by

ENGINEER(WT) 02/07/26

CC TO: ENGINEER (TECH)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM 530012
DEPARTMENT OF WELDING TECHNOLOGY

HEAT TREATMENT TECHNOLOGY SHEET				HT CYCLE NO.		H-054R1-2026		
				DATE		02-07-2026		
Name of the Equipment		S.O.NO.	Drawing no.			Customer		
LTSH LOWER COIL ASSY		8136 (11-237)	1-11-237-U8100 to 1-11-237-U8106			M/s. HINDALCO SAMBALPUR		
Part Name	Part No.	Material Spec.	Principle Dimensions (mm)			DESIGN PRESSURE	DESIGN TEMP.	
---	DU001 TO DU007	SA213T11 SA210GrC IS2062E250 SA240TP304 SA387GR12CL2	OD	ID	THK	As Per Drawing	As per Drawing	
			44.5	---	5.0 / 4.5			

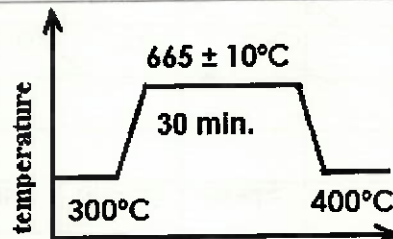
CODE: AS PER DRG.

INSPN. AGENCY: AS PER DRG.

NOMINAL WELD THICKNESS= 5.0 mm

TYPE OF HEAT TREATMENT

PWHT AFTER FORMATION OF COIL ASSEMBLY AND WELDING OF ALL ATTACHMENTS INCLUDING TUBES BUTT WELDING AS PER DRAWING.



- 1) Load the job on suitable supports in furnace at below 300°C.
- 2) Heat at the rate of 110°C/hr (Max.) up to the temperature of 665 ± 10°C.
- 3) Soak at 665 ± 10°C for 30 minutes
- 4) Cool in closed furnace at the rate of 140°C/hr (Max.) up to 400°C and controlled cooling rates are not applicable from 400°C.

GENERAL PRECAUTIONS:

- A. The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- B. Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- C. Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the vessel at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation. It shall be ensured that distance between any two thermocouples along with length of equipment is not more than 4.6 meters.
- D. Thermocouple (TC) shall be tack welded to the plate on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- E. Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- F. During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- G. Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

Issued by

ENGINEER(WT)

CC TO: ENGINEER (TECH)



**BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT**

HEAT TREATMENT TECHNOLOGY SHEET		FORMING OPERATION COLD FORMING	
HT CYCLE NO.: H-083-2026		DATE: 14.07.2026	
S.O.NO. 8136 (11-274)	PART NO.: CIR-03, Pno:02	PRINCIPLE DIMENSIONS (mm)	
PART NAME: SH COIL ASLY	QTY.: AS PER DRG.	O.D. 44.5	
DRG NO: 2-11-274-U8082 R00		I.C.R. --- I.K.R. ---	
MATL SPEC.: SA213T91	PROJECT: M/s. HINDALCO SAMBALPUR;	THICKNESS: 9	
CODE: AS PER DRAWING		INSPEC.: AS PER DRAWING	

OTHER DETAILS: NORMALISING & TEMPERING TO BE FOLLOWED AFTER COLD FORMING TO RADIUS 65 FOR SA213T91 MATERIAL WITH DESIGN TEMPERATURES >540 & $\leq 600^{\circ}\text{C}$ and R/D <2 (as per SQP PP08/13 page 12)

I. HEAT TREATMENT AFTER COLD BENDING TO BEND RADIUS 65:

OPERATION*	Loading Temp.	Rate of Heating	Holding Temp.	Soaking Time Minimum	Rate of Cooling	Cooling Medium
NORMALIZING	$< 300^{\circ}\text{C}$	220°C/hr	1050 ± 10	15 Minutes	In still air	NORMALIZING
TEMPERING	$< 300^{\circ}\text{C}$	220°C/hr	745 ± 10	30 Minutes	In still air	TEMPERING

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, center and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

ISSUED BY:


ENGINEER / WT 14/07/26

CC TO: Engineer (PLG.)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT

HEAT TREATMENT TECHNOLOGY SHEET		FORMING OPERATION HOT FORMING	
HT CYCLE NO.: H-084-2026		DATE: 14.07.2026	
S.O.NO. 8136 (11-274)	PART NO.: CIR-01, PNo:02 & CIR-02, PNo:02	PRINCIPLE DIMENSIONS (mm)	
PART NAME: COIL TUBES	QTY.: AS PER DRG.	O.D. 44.5	
DRG NO: 2-11-274-U8080 R00 & 2-11-274-U8081 R00		I.C.R. --- I.K.R. ---	
MATL SPEC.: SA213T91	PROJECT: M/s. HINDALCO SAMBALPUR	THICKNESS: 9	
CODE: AS PER DRAWING		INSPEC.: AS PER DRAWING	

OTHER DETAILS: AFTER COLD BENDING TO RADIUS 143

I. HEAT TREATMENT AFTER COLD BENDING TO BEND RADIUS 143:

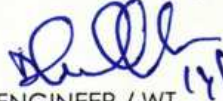
OPERATION*	Loading Temp.	Rate of Heating	Holding Temp.	Soaking Time Minimum	Rate of Cooling	Cooling Medium
STRESS RELIEVING/ PWHT	≤300 °C	110°C/hr Max	745±10°C	30 Minutes	140°C/hr	Upto 300 cool in furnace

***Post forming heat treatment i.e., SR after Cold bending can be carried with final PWHT of welds for respective coil tubes subjected to cold bending.**

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

ISSUED BY:


14/07/26
ENGINEER / WT

CC TO: Engineer (P - TECH)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM 530012
DEPARTMENT OF WELDING TECHNOLOGY

HEAT TREATMENT TECHNOLOGY SHEET				HT CYCLE NO.		H-085-2026		
				DATE		14-07-2026		
Name of the Equipment		S.O.NO.	Drawing no.			Customer		
SH. VERTICAL SPACED COIL ASSY.		8136 (11-274)	2-11-274-U8079 R00			M/s. HINDALCO SAMBALPUR		
Part Name	Part No.	Material Spec.	Principle Dimensions (mm)			DESIGN PRESSURE	DESIGN TEMP.	
---	DU001	SA213T22 SA387GR22CL2 SA213T91	OD	ID	THK	As Per Drawing	As per Drawing	
			44.5	---	8.0 / 9.0			

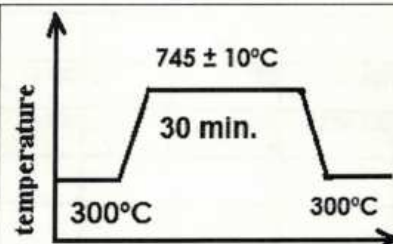
CODE: AS PER DRG.

NOMINAL WELD THICKNESS= 9.0 mm

INSPN. AGENCY: AS PER DRG.

TYPE OF HEAT TREATMENT

PWHT AFTER FORMATION OF COIL ASSEMBLY AND WELDING OF ALL ATTACHMENTS INCLUDING TUBES BUTT WELDING AS PER DRAWING.



- 1) Load the job on suitable supports in furnace at below 300°C.
- 2) Heat at the rate of 110°C/hr (Max.) up to the temperature of 745 ± 10°C.
- 3) Soak at 745 ± 10°C for 30 minutes
- 4) Cool in closed furnace at the rate of 140°C/hr (Max.) up to 300°C and controlled cooling rates are not applicable from 300°C.

GENERAL PRECAUTIONS:

- A. The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- B. Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- C. Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the vessel at bottom, centre And top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation. It shall be ensured that distance between any two thermocouples along with length of equipment is not more than 4.6 meters.
- D. Thermocouple (TC) shall be tack welded to the plate on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- E. Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- F. During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- G. Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

Issued by

[Signature]
ENGINEER(WT) 14/07/26

CC TO: ENGINEER (TECH)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT

HEAT TREATMENT TECHNOLOGY SHEET		FORMING OPERATION COLD FORMING	
HT CYCLE NO.: H-091-2026		DATE: 14.07.2026	
S.O.NO. 8136 (11-278)	PART NO.: CIR-01, PNO 02, CIR-02, PNO 01&03, CIR-03, PNO 01, CIR-04, PNO 01, CIR-05, PNO 01, CIR-06, PNO 01&03	PRINCIPLE DIMENSIONS (mm)	
PART NAME: COIL TUBES	QTY.: AS PER DRG.	O.D. 47.63	
DRG NO: 2-11-278-U8083 R00 & 2-11-278-U8088 R00		I.C.R. --- I.K.R. ---	
MATL SPEC.: SA213T91	PROJECT: M/s. HINDALCO SAMBALPUR	THICKNESS: 5.6 & 6.6	
CODE: AS PER DRAWING		INSPEC.: AS PER DRAWING	

OTHER DETAILS: AFTER COLD BENDING TO RADIUS 152

I. HEAT TREATMENT AFTER COLD BENDING TO BEND RADIUS 152:

OPERATION*	Loading Temp.	Rate of Heating	Holding Temp.	Soaking Time Minimum	Rate of Cooling	Cooling Medium
STRESS RELIEVING/ PWHT	≤300 °C	110°C/hr Max	745±10°C	30 Minutes	140°C/hr	Upto 300 cool in furnace

***Post forming heat treatment i.e., SR after Cold bending can be carried with final PWHT of welds for respective coil tubes subjected to cold bending.**

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

ISSUED BY:


ENGINEER / WT 14/07/26

CC TO: Engineer (P - TECH)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT

HEAT TREATMENT TECHNOLOGY SHEET

FORMING OPERATION
HOT FORMING

HT CYCLE NO.: H-092-2026

DATE: 14.07.2026

S.O.NO. 8136(11-278)	PART NO.: 'CIR-02, PNO 03 CIR-06, PNO 03	PRINCIPLE DIMENSIONS (mm)
----------------------	---	---------------------------

PART NAME: COIL TUBES	QTY.: AS PER DRG.	O.D. 47.63
-----------------------	-------------------	------------

DRG NO: 2-11-278-U8084 R00 & 2-11-278-U8088 R00	I.C.R. --- I.K.R. ---
---	-----------------------

MATL SPEC.: SA213T91	PROJECT: M/s. HINDALCO Sambalpur	THICKNESS: 6.6
-------------------------	----------------------------------	----------------

CODE: AS PER DRAWING	INSPEC.: AS PER DRAWING
----------------------	-------------------------

OTHER DETAILS: 1) Cold forming of Tube to Radius R85.5 mm and subsequent forming operation to Radius 28.5 mm (Hot squeezing and sizing) as per drawing.

- I. COLD BENDING OF TUBE RADIUS to R85.5 mm.
- II. SUBSEQUENT FORMING OPERATION (HOT SQUEEZING AND SIZING TO RADIUS 28.5):
- a) Loading Temperature(°C) : < 300
 - b) Rate of heating (°C/hr) : 220 MAX.
 - c) Holding temperature(°C) : 980 ±10
 - d) Minimum soaking time : 20 minutes
 - e) maximum soaking time : 40 minutes
- III. HEAT TREATMENT AFTER HOT SQUEEZING AND SIZING:

OPERATION	Loading Temp.	Rate of Heating	Holding Temp.	Soaking Time Minimum	Rate of Cooling	Cooling Medium
NORMALIZING	< 300°C	220°C/hr	1050 ±10	15 Minutes	In still air	NORMALIZING
TEMPERING	< 300°C	220°C/hr	745 ±10	30 Minutes	In still air	TEMPERING

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

APPROVED BY:

ENGINEER. (WT)

[Signature]
14/07/26

CC TO: ENGINEER (PRDN-T)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT

HEAT TREATMENT TECHNOLOGY SHEET

FORMING OPERATION
COLD FORMING

HT CYCLE NO.: H-093-2026

DATE: 14.07.2026

S.O.NO. 8136(11-278)	PART NO.: 'CIR-03, PNO 03, CIR-04, PNO 03, CIR-05, PNO 03	PRINCIPLE DIMENSIONS (mm)
----------------------	---	---------------------------

PART NAME: COIL TUBES	QTY.: AS PER DRG.	O.D. 47.63
-----------------------	-------------------	------------

DRG NO: 2-11-278-U8085 R00 to 2-11-278-U8087 R00	I.C.R. --- I.K.R. ----
--	------------------------

MATL SPEC.: SA213T91	PROJECT: M/s. HINDALCO Sambalpur	THICKNESS: 6.6
-------------------------	----------------------------------	----------------

CODE: AS PER DRAWING	INSPEC.: AS PER DRAWING
----------------------	-------------------------

OTHER DETAILS: 1) Cold forming of Tube to Radius R85.5 mm.

I. COLD BENDING OF TUBE RADIUS to R85.5 mm.

OPERATION	Loading Temp.	Rate of Heating	Holding Temp.	Soaking Time Minimum	Rate of Cooling	Cooling Medium
NORMALIZING	< 300°C	220°C/hr	1050 ±10	15 Minutes	In still air	NORMALIZING
TEMPERING	< 300°C	220°C/hr	745 ±10	30 Minutes	In still air	TEMPERING

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

APPROVED BY:

ENGINEER. (WT) 14/08/26

CC TO: ENGINEER (PRDN-T)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT

HEAT TREATMENT TECHNOLOGY SHEET

FORMING OPERATION
COLD FORMING

HT CYCLE NO.: H-094-2026

DATE: 14.07.2026

S.O.NO. 8136 (11-278)	PART NO.: CIR-01, PNO 03, CIR-02, PNO 02, CIR-03, PNO 02, CIR-04, PNO 02, CIR-05, PNO 02	PRINCIPLE DIMENSIONS (mm)
PART NAME: COIL TUBES	QTY.: AS PER DRG.	O.D. 47.63
DRG NO: 2-11-278-U8083 R00 to 2-11-278-U8088 R00		I.C.R. -- I.K.R. ----
MATL SPEC.: SA213TP347H	PROJECT: M/s. HINDALCO SAMBALPUR	THICKNESS: 5.6
CODE: AS PER DRAWING		INSPEC.: AS PER DRAWING

OTHER DETAILS: 1) FOR TUBES AFTER COLD BENDING TO RADIUS 171, 152 & 85.5

- HEAT TREATMENT AFTER COLD BENDING TO BEND RADIUS 171:
PFHT not required (CIR-01, PNO 03).
- HEAT TREATMENT AFTER COLD BENDING TO BEND RADIUS 152 & 85.5:

OPERATION	Loading Temp.	Rate of Heating	Holding Temp.	Soaking Time	Rate of Cooling	Cooling Medium
Solution annealing	400 °C	220°C/hr	1115±10° C	10 Minutes Minimum	Cool under blast air to below 300 °C within 3 minutes	

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

ISSUED BY:


ENGINEER / WT 14/07/26

CC TO: Engineer (P - TECH)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT

HEAT TREATMENT TECHNOLOGY SHEET		FORMING OPERATION COLD/HOT FORMING	
HT CYCLE NO.: H-095-2026		DATE: 14.07.2026	
S.O.NO. 8136 (11-278)	PART NO.: CIR-06, PNO 02	PRINCIPLE DIMENSIONS (mm)	
PART NAME: COIL TUBES	QTY.: AS PER DRG.	O.D. 47.63	
DRG NO: 2-11-278-U8088 R00		I.C.R. -- I.K.R. ---	
MATL SPEC.: SA213TP347H	PROJECT: M/s. HINDALCO SAMBALPUR	THICKNESS: 5.6	
CODE: AS PER DRAWING		INSPEC.: AS PER DRAWING	
OTHER DETAILS: 1) FOR TUBES AFTER COLD BENDING TO RADIUS 85.5 2) FOR TUBES, HOT FORMING OPERATION, HOT SQUEEZING & SIZING TO RADIUS 85.5 FROM R28.5.			

1. HEAT TREATMENT AFTER COLD BENDING TO BEND RADIUS 85.5:
2. HEAT TREATMENT FOR TUBES, FORMING OPERATION (HOT SQUEEZING AND SIZING TO RADIUS 85.5 FROM R28.5):
 - a) Loading Temperature(°C) : < 300
 - b) Rate of heating (°C/hr) : 220 MAX.
 - c) Holding temperature(°C) : 1000 ±10
 - d) Minimum soaking time : 15 minutes
 - e) maximum soaking time : 30 minutes

3. HEAT TREATMENT AFTER HOT SQUEEZING AND SIZING OF SL.NO.:

OPERATION	Loading Temp.	Rate of Heating	Holding Temp.	Soaking Time	Rate of Cooling	Cooling Medium
Solution annealing	400 °C	220°C/hr	1115±10° C	10 Minutes Minimum		Cool under blast air to below 300 °C within 3 minutes

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

ISSUED BY:


ENGINEER / WT 14/07/26

CC TO: Engineer (P - TECH)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM 530012
DEPARTMENT OF WELDING TECHNOLOGY

HEAT TREATMENT TECHNOLOGY SHEET				HT CYCLE NO.		H-096-2026		
				DATE		14-07-2026		
Name of the Equipment		S.O.NO.	Drawing no.			Customer		
SH VERTICAL PLATEN COIL		8136 (11-278)	1-11-278-U8119 R00			M/s. HINDALCO SAMBALPUR		
Part Name	Part No.	Material Spec.		Principle Dimensions (mm)			DESIGN PRESSURE	DESIGN TEMP.
---	DU001	SA213 T22, SA213 T91 SA213TP 347H, SA387 Gr22Cl2, SA315GRCH20. IS2062		OD	ID	THK	As Per Drawing	As per Drawing
				47.6 3	---	5.6/ 6.6		

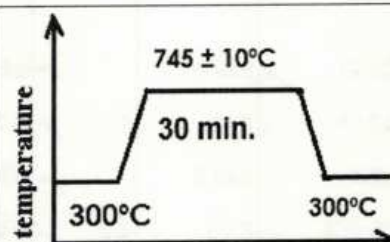
CODE: AS PER DRG.

INSPN. AGENCY: AS PER DRG.

NOMINAL WELD THICKNESS= 6.6 mm

TYPE OF HEAT TREATMENT

PWHT AFTER FORMATION OF COIL ASSEMBLY AND WELDING OF ALL ATTACHMENTS INCLUDING TUBES BUTT WELDING AS PER DRAWING.



- 1) Load the job on suitable supports in furnace at below 300°C.
- 2) Heat at the rate of 110°C/hr (Max.) up to the temperature of 745 ± 10°C.
- 3) Soak at 745 ± 10°C for 30 minutes
- 4) Cool in closed furnace at the rate of 140°C/hr (Max.) up to 300°C and controlled cooling rates are not applicable from 300°C.

GENERAL PRECAUTIONS:

- A. The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- B. Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- C. Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the vessel at bottom, centre And top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation. It shall be ensured that distance between any two thermocouples along with length of equipment is not more than 4.6 meters.
- D. Thermocouple (TC) shall be tack welded to the plate on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- E. Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- F. During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- G. Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

Issued by

ENGINEER(WT)

CC TO: ENGINEER (TECH)



**BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT**

HEAT TREATMENT TECHNOLOGY SHEET

**FORMING OPERATION
HOT FORMING**

HT CYCLE NO.: H-086-2026		DATE: 14.07.2026
S.O.NO. 8136(16-275)	PART NO.: CIRCUIT-03	PRINCIPLE DIMENSIONS (mm)
PART NAME: COIL TUBES	QTY.: AS PER DRG.	O.D. 54
DRG NO: 2-16-275-U0003 R00		I.C.R. --- I.K.R. ---
MATL SPEC.: SA213T11	PROJECT: M/s. HINDALCO Sambalpur	THICKNESS: 4.0
CODE: AS PER DRAWING		INSPEC.: AS PER DRAWING

OTHER DETAILS: 1) Cold forming of Tube to Radius to $R/D > 2$ and subsequent forming operation to Radius 76.2 mm (Hot squeezing and sizing) as per drawing.

- I. COLD BENDING OF TUBE RADIUS to $R/D > 2$.
SR NOT REQUIRED AS PER CLAUSE 2.1, SQP: PP:08/13, BHEL TRICHY STANDARD
- II. SUBSEQUENT FORMING OPERATION (HOT SQUEEZING AND SIZING TO RADIUS 76.2):
a) Loading Temperature($^{\circ}\text{C}$) : < 300
b) Rate of heating ($^{\circ}\text{C/hr}$) : 220 MAX.
c) Holding temperature($^{\circ}\text{C}$) : 910 ± 10
d) Minimum soaking time : 15 minutes
e) maximum soaking time : 30 minutes
- III. HEAT TREATMENT AFTER HOT SQUEEZING AND SIZING:
SR NOT REQUIRED AS PER CLAUSE 2.1, SQP: PP:08/13, BHEL TRICHY STANDARD

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

APPROVED BY:

ENGINEER. (WT)

CC TO: ENGINEER (PRDN-T)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM 530012
DEPARTMENT OF WELDING TECHNOLOGY

HEAT TREATMENT TECHNOLOGY SHEET				HT CYCLE NO.		H-087-2026	
				DATE		14-07-2026	
Name of the Equipment		S.O.NO.	Drawing no.			Customer	
RH. VERT. SPCD. FRONT ASSY.		8136 (16-275)	1-16-275-U0001 R00			M/s. HINDALCO SAMBALPUR	
Part Name	Part No.	Material Spec.	Principle Dimensions (mm)			DESIGN PRESSURE	DESIGN TEMP.
---	DU001	SA213 T22, SA213 T11 SA387 Gr22Cl2, SA240TYP430 SA351 GrCH20, IS2062	OD	ID	THK	As Per Drawing	As per Drawing
			54	---	4.0		

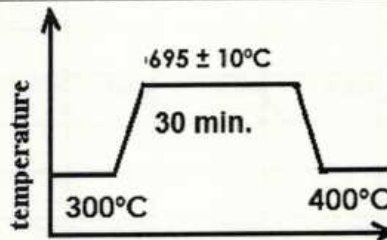
CODE: AS PER DRG.

INSPN. AGENCY: AS PER DRG.

NOMINAL WELD THICKNESS= 4.0 mm

TYPE OF HEAT TREATMENT

PWHT AFTER FORMATION OF COIL ASSEMBLY AND WELDING OF ALL ATTACHMENTS INCLUDING TUBES BUTT WELDING AS PER DRAWING.



- 1) Load the job on suitable supports in furnace at below 300°C.
- 2) Heat at the rate of 110°C/hr (Max.) up to the temperature of 695 ± 10°C.
- 3) Soak at 695 ± 10°C for 30 minutes
- 4) Cool in closed furnace at the rate of 140°C/hr (Max.) up to 400°C and controlled cooling rates are not applicable from 400°C.

GENERAL PRECAUTIONS:

- A. The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- B. Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- C. Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the vessel at bottom, centre And top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation. It shall be ensured that distance between any two thermocouples along with length of equipment is not more than 4.6 meters.
- D. Thermocouple (TC) shall be tack welded to the plate on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- E. Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- F. During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- G. Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

Issued by

ENGINEER(WT)

[Signature]
14/08/26

CC TO: ENGINEER (TECH)



**BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT**

HEAT TREATMENT TECHNOLOGY SHEET		FORMING OPERATION COLD FORMING	
HT CYCLE NO.: H-088-2026		DATE: 14.07.2026	
S.O.NO. 8136 (16-277)	PART NO.: CIR-01, PNO 01, CIR-02, PNO 01, CIR-03, PNO 01, CIR-04, PNO 01, CIR-05, PNO 01	PRINCIPLE DIMENSIONS (mm)	
PART NAME: COIL TUBES	QTY.: AS PER DRG.	O.D. 54	
DRG NO: 2-16-277-U0006 R00 & 2-16-277-U0010 R00		I.C.R. --- I.K.R. ---	
MATL SPEC.: SA213T91	PROJECT: M/s. HINDALCO SAMBALPUR	THICKNESS: 4	
CODE: AS PER DRAWING		INSPEC.: AS PER DRAWING	

OTHER DETAILS: AFTER COLD BENDING TO RADIUS 165

I. HEAT TREATMENT AFTER COLD BENDING TO BEND RADIUS 165:

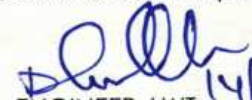
OPERATION*	Loading Temp.	Rate of Heating	Holding Temp.	Soaking Time Minimum	Rate of Cooling	Cooling Medium
STRESS RELIEVING/ PWHT	≤300 °C	110°C/hr Max	745±10°C	30 Minutes	140°C/hr	Upto 300 cool in furnace

***Post forming heat treatment i.e., SR after Cold bending can be carried with final PWHT of welds for respective coil tubes subjected to cold bending.**

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

ISSUED BY:


ENGINEER / WT 14/07/26

CC TO: Engineer (P - TECH)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT

HEAT TREATMENT TECHNOLOGY SHEET

FORMING OPERATION
HOT FORMING

HT CYCLE NO.: H-089-2026

DATE: 14.07.2026

S.O.NO. 8136(16-277)	PART NO.: 'CIRCUIT-04, PART-02	PRINCIPLE DIMENSIONS (mm)
PART NAME: COIL TUBES	QTY.: AS PER DRG.	O.D. 54
DRG NO: 2-16-277-U0009 R00		I.C.R. --- I.K.R. ---
MATL SPEC.: SA213T22	PROJECT: M/s. HINDALCO Sambalpur	THICKNESS: 4.0
CODE: AS PER DRAWING		INSPEC.: AS PER DRAWING

OTHER DETAILS: 1) Cold forming of Tube to Radius to $R/D > 2$ and subsequent forming operation to Radius 76.2 mm (Hot squeezing and sizing) as per drawing.

I. COLD BENDING OF TUBE RADIUS to $R/D > 2$.

SR NOT REQUIRED AS PER CLAUSE 2.1, SQP: PP:08/13, BHEL TRICHY STANDARD

II. SUBSEQUENT FORMING OPERATION (HOT SQUEEZING AND SIZING TO RADIUS 76.2):

- a) Loading Temperature(°C) : < 300
- b) Rate of heating (°C/hr) : 220 MAX.
- c) Holding temperature(°C) : 910 ± 10
- d) Minimum soaking time : 15 minutes
- e) maximum soaking time : 30 minutes

III. HEAT TREATMENT AFTER HOT SQUEEZING AND SIZING:

OPERATION*	Loading Temp.	Rate of Heating	Holding Temp.	Soaking Time Minimum	Rate of Cooling	Cooling Medium
STRESS RELIEVING/ PWHT	≤ 300 °C	110°C/hr Max	695±10°C	30 Minutes	140°C/hr	Upto 300 cool in furnace

***Post forming heat treatment i.e., SR after Cold bending can be carried with final PWHT of welds for respective coil tubes subjected to cold bending.**

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

APPROVED BY:

ENGINEER. (WT)

CC TO: ENGINEER (PRDN-T)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM 530012
DEPARTMENT OF WELDING TECHNOLOGY

HEAT TREATMENT TECHNOLOGY SHEET				HT CYCLE NO.		H-090-2026	
				DATE		14-07-2026	
Name of the Equipment		S.O.NO.	Drawing no.		Customer		
RH. VERT. SPCD. REAR ASSY.		8136 (16-277)	1-16-277-U0002 R00		M/s. HINDALCO SAMBALPUR		
Part Name	Part No.	Material Spec.	Principle Dimensions (mm)			DESIGN PRESSURE	DESIGN TEMP.
---	DU001	SA213 T22, SA213 T91, SA387 Gr22Cl2, SA240TYP430, SA351GrCH20, IS2062 SA167TP310, SA479TYP304	OD	ID	THK	As Per Drawing	As per Drawing
			54	---	4.0		

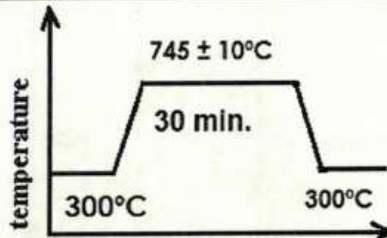
CODE: AS PER DRG.

INSPN. AGENCY: AS PER DRG.

NOMINAL WELD THICKNESS= 4.0 mm

TYPE OF HEAT TREATMENT

PWHT AFTER FORMATION OF COIL ASSEMBLY AND WELDING OF ALL ATTACHMENTS INCLUDING TUBES BUTT WELDING AS PER DRAWING.



- 1) Load the job on suitable supports in furnace at below 300°C.
- 2) Heat at the rate of 110°C/hr (Max.) up to the temperature of 745 ± 10°C.
- 3) Soak at 745 ± 10°C for 30 minutes
- 4) Cool in closed furnace at the rate of 140°C/hr (Max.) up to 300°C and controlled cooling rates are not applicable from 300°C.

GENERAL PRECAUTIONS:

- A. The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- B. Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- C. Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the vessel at bottom, centre And top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation. It shall be ensured that distance between any two thermocouples along with length of equipment is not more than 4.6 meters.
- D. Thermocouple (TC) shall be tack welded to the plate on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- E. Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- F. During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- G. Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

Issued by

ENGINEER(WT)

[Signature]
14/07/26

CC TO: ENGINEER (TECH)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT

HEAT TREATMENT TECHNOLOGY SHEET		FORMING OPERATION HOT FORMING
HT CYCLE NO.: H-048-2026		DATE: 11.05.2026
S.O.NO. 8136(19-114)	PART NO.: 001-01-01, 001-01-02, 001-01-03, 001-01-04, 002-03-01, 002-03-02, 002-03-03, 002-03-04	PRINCIPLE DIMENSIONS (mm)
PART NAME: COIL TUBES	QTY.: AS PER DRG.	O.D. 38.1
DRG NO: 2-19-114-U8036 to 2-19-114-U8043;		I.C.R. --- I.K.R. ---
MATL SPEC.: SA210GRA1	PROJECT: M/s. HINDALCO Sambalpur	THICKNESS: 4.0
CODE: AS PER DRAWING		INSPC.: AS PER DRAWING

OTHER DETAILS: 1) Cold forming of Tube to Radius 114.3 mm and subsequent forming operation to Radius 38.1 mm (Hot squeezing and sizing) as per drawing.

- I. COLD BENDING OF TUBE D51 TO FINAL RADIUS R114.3 AS PER DRAWING.
SR NOT REQUIRED AS PER CLAUSE 2.1, SQP: PP:08/09, BHEL TRICHY STANDARD
- II. SUBSEQUENT FORMING OPERATION (HOT SQUEEZING AND SIZING TO RADIUS 38.1):
 - a) Loading Temperature(°C) : < 300
 - b) Rate of heating (°C/hr) : 220 MAX.
 - c) Holding temperature(°C) : 910 ±10
 - d) Minimum soaking time : 15 minutes
 - e) maximum soaking time : 30 minutes
- III. HEAT TREATMENT AFTER HOT SQUEEZING AND SIZING:
SR NOT REQUIRED AS PER CLAUSE 2.1, SQP: PP:08/09, BHEL TRICHY STANDARD

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

APPROVED BY:

ENGINEER. (WT)

CC TO: DY. ENGINEER (PRDN-T)



BHARAT HEAVY ELECTRICALS LIMITED
HPVP-VISAKHAPATNAM
WELDING TECHNOLOGY DEPARTMENT

HEAT TREATMENT TECHNOLOGY SHEET

FORMING OPERATION
HOT FORMING

HT CYCLE NO.: H-049-2026

DATE: 11.05.2026

S.O.NO. 8136(19-124)

PART NO.: 001-01-01, 001-01-02,
001-01-03, 001-01-04, 002-03-01,
002-03-02, 003-04-01, 003-04-02,
004-06-01, 004-06-02, 004-06-03,
004-06-04.

PRINCIPLE DIMENSIONS (mm)

PART NAME: COIL TUBES

QTY.: AS PER DRG.

O.D. 38.1

DRG NO: 2-19-124-U8044 to 2-19-124-U8051;

I.C.R. --- I.K.R. ---

MATL SPEC.:
SA210GRA1

PROJECT: M/s. HINDALCO Sambalpur

THICKNESS: 4.0

CODE: AS PER DRAWING

INSPC.: AS PER DRAWING

OTHER DETAILS: 1) Cold forming of Tube to Radius 114.3 mm and subsequent forming operation to Radius 38.1 mm (Hot squeezing and sizing) as per drawing.

I. COLD BENDING OF TUBE D51 TO FINAL RADIUS R114.3 AS PER DRAWING.

SR NOT REQUIRED AS PER CLAUSE 2.1, SQP: PP:08/09, BHEL TRICHY STANDARD

II. SUBSEQUENT FORMING OPERATION (HOT SQUEEZING AND SIZING TO RADIUS 38.1):

- a) Loading Temperature(°C) : < 300
- b) Rate of heating (°C/hr) : 220 MAX.
- c) Holding temperature(°C) : 910 ±10
- d) Minimum soaking time : 15 minutes
- e) maximum soaking time : 30 minutes

III. HEAT TREATMENT AFTER HOT SQUEEZING AND SIZING:

SR NOT REQUIRED AS PER CLAUSE 2.1, SQP: PP:08/09, BHEL TRICHY STANDARD

GENERAL PRECAUTIONS:

- The furnace atmosphere shall be maintained neutral or slightly reducing during heat treatment.
- Care shall be taken to ensure that no flame impingement takes place on the job during heat treatment. Baffles shall be erected wherever necessary.
- Sufficient number of thermocouples shall be placed in consultation with shop inspector / inspection agency on the part at bottom, centre and top of the charge by covering the areas of maximum and minimum thickness and other areas as possible variation.
- If QAP/GMS/DRAWING mentions PTC requirement, then Production Test Coupon (PTC) shall be loaded for post forming heat treatment operation and is located close to the Job.
- Thermocouple (TC) shall be tack welded to the Job on consultation with shop inspector / inspection agency and the same TC shall be removed by grinding.
- Material temperature shall be recorded with the help of calibrated automatic recorder and calibrated thermocouples only.
- During heating period, the temperature difference shall not exceed 140°C over any length of 4.6 metres.
- Technology department shall incorporate necessary precautions to be followed in shop floor to avoid distortion.

APPROVED BY:

ENGINEER. (WT)

CC TO: ENGINEER (PRDN-T)

BHARAT HEAVY ELECTRICALS LIMITED
HPVP UNIT - VISAKHAPATNAM - 530012

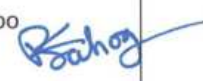


M/S. Hindalco, Sambalpur 1x510 TPH UTILITY COAL FIRED BOILER PACKAGE

HPVP S.O. No. 8136

PAINTING SCHEDULE

Doc. no: PAINT-8136-DOC-00001

03	 S KUMAR MANIKYAM Sr Manager/Engg.	Pabitra Kumar Sahoo DGM /-Engg. 	Pabitra Kumar Sahoo DGM /-Engg. 
Rev No	Prepared by	Reviewed by	Approved by

Rev. No	Date	Details of revision	Remarks
00	09-01-2026	NEW	Prepared in line with BHEL standard painting scheme applicable for normal environment.
01	27-01-2026	UPDATED INLINE WITH COMMENTS	
02	07-02-2026	UPDATED INLINE WITH COMMENTS	Painting Schedule approved in code-1 dated 10-02-2026
03	13-02-2026	Shade for Inorganic zinc silicate updated in Page 11	

RECORD OF REVISIONS

Sl. NO.	Scheme No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat at site		Finish coat at site			Total DFT μm (min)
				Paint	No. of coats /DFT	Paint	No. of coats	Paint	No. of coats	Shade	
1.1	1AC	Drum (Except Internals) 04 – 124	Blasting according to SIS 055900 GRADE: SA 2 1/2	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	1 / DFT= 30m per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20m per coat	Inter- national Orange Shade No: 592 of IS 5	70
1.2	1AC	Drum Suspension 04 - 144	Blasting according to SIS 055900 GRADE: SA 2 1/2	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	1/ DFT= 30m per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20m per coat	Inter- national Orange Shade No: 592 of IS 5	70
1.3	5	Drum Internals 04 – 134, 136, 138 Other Machine Components 43 – 101, 102, 103, 104, 105, 106, 107	Blasting according to SIS 055900 GRADE: SA 2 1/2	Rust Preventive Fluid to PR: CHEM: 09 – 04	1 DFT=20m per coat	--	--	--	--	--	20
1.4	1AE	Drum Transport Structures 04 - 194, 196, 35 - 810	Blasting according to SIS 055900 GRADE: SA 2 1/2	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	1 DFT= 30m per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20m per coat	Yellow Shade No: 356 of IS 5	70
2.1	11	Foundation Materials and Pin: 35 - 010, 190 – 39 – 010, 020, 48 – 019 & Columns below "0" level of PG 35,36, 38 & 39	Blasting according to SIS 055900 GRADE: SA 2 1/2	--	Red Oxide (Rust preventive paint required)	--	--	No Paint		--	--

Sl. No.	Scheme No.	PGMA / Description	Surface Preparation &- Surface Profile	Primer coat		Intermediate coat at site		Finish coat at site			Total DFT µm (min)
				Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
22	1A	Buck Stays and Structural Items: Buck stays 08 – 001, 101, 104, 107, 111, 400,700, 900,904 Boiler Supporting Structures 35, 36, 38,39,66 (EXCEPT FLOOR GRILS, LADDERS & STAIRS, HANDRAILS & POSTS) For No paint zones Refer note no: 19 Duct Supports 48 – 005, 015, 025, 045, 055, 065, 085, 105, 115, 125, 145, 155, 185, 195, 200,205, 215, 225, 235, 245, 255, 265, 275, 295, 305, 315, 325, 335, 345, 355, 365, 375, 385, 415, 425, 435, 445, 455, 465, 475, 485, 495, 665, 805, 815, 825, 845, 855, 865, 875, 885, 995 Piping Centre: 80-800 to 882, 920 to 933, 940	Blasting according to SIS 055900 GRADE: SA 2 1/2	Inorganic Zinc silicate	1 / DFT= 75 µm per coat	High build micaceous iron oxide epoxy	1 DFT= 75 µm per coat	High build micaceous epoxy polyamide (pigmented)	2 / DFT= 75 µm per coat	Dark Admiralty Grey Shade no. 632 is5	300

Sl. No.	Scheme No.	PGMA / Description	Surface Preparation &- Surface Profile	Primer coat		Intermediate coat at site		Finish coat at site			Total DFT μm (min)
				Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
23	1AB	Floor grills, 35 – 811 36 - 810, 38 - 810, 811 39 – 810, Hand Rails 35 - 850, 36 - 850 38 - 850, 851 39 - 850, Ladders 35 – 820 36 – 820 38 – 820 39 – 820	Hot dip Galvanizing to a coating weight of 610 gm per sq. m (minimum) and to a coating thickness of 85.0 microns (minimum). Any damaged portion post preparation of components to be cold spray galvanized with Zinc rich primer (2 coats with each of 75 μm)								

Sl. No.	Scheme No.	PGMA / Description	Surface Preparation &- Surface Profile	Primer coat		Intermediate coat at site		Finish coat at site			Total DFT µm (min)
				Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
3.1	10	Components >95 C Un-insulated other than components coming in Gas Path 09 - 001, 002, 003 24 – 220, 28 – 220 42 – 300,358 07-401,410,420,431,700 17-904,919,928 19-901,905,906,907 12- 901, 903, 906, 914, 917, 924, 928, 944, 948, 954,	Blasting according to SIS 055900 GRADE: SA 2 1/2	Heat Resistant Aluminium Paint to IS 13183 Grade-I	1 (DFT =15 microns)	- -	- -	Heat Resistant Aluminium Paint to IS 13183 Grade-I	1 (DFT =15 m per coat)	Aluminium	30

3.2	3	Components >95 C Insulated 05 - 137, 147,155,175, 227, 229, 231,251, 07 - 108, 109, 215, 216,218, 223, 225, 226, 229, 231, 232 10 – 135, 174, 178, 191, 235, 274, 278, 283, 284, 291,687 15 –174, 274,18 – 001,010, 020 19 – 701, 702, 753,763, 21 – 600 24 – 200, 215, 275, 500 42 - 128, 158, 48 –202, 204, 207,212, 214, 222, 224, 382,384, 432, 434, 462, 464 , 482, 484, 492, 494, 499, 662, 664, 667, 38011,120,250,360,211,212,213,451,4 52,541,543,304,810,820,850,440,48 – 380.	Blasting according to SIS 055900 GRADE: SA 2 1/2	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30m per coat	-	--	--	--	Red Oxide	60
-----	---	--	---	---	---------------------------	---	----	----	----	-----------	----

Sl. No.	Scheme No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat at site		Finish coat at site			Total DFT µm (min)
				Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
3.3	2	Heat Transfer Exchanger Coils: (SH, RH & Economiser Coils) Panels: 11- 682, 683, 684, 685, 687, 691, 694, Pipes: 11 - 236, 237,274, 278, 12 – 174, 184, 187, 535,803, 805, 850, 851, 852, 900, 16 –275, 277 19 -114, 124, 802	Blasting according to SIS 055900 GRADE: SA 2 1/2	Red Oxide Zinc Phosphate Dip coat primer to PR: CHEM: 09 – 03	1 DFT= 35m per coat	--	--	--	--	--	35
3.4	3	Components coming in Gas Path other than Coils 06 -400, 631, 637, 640, 647, 651, 655, 10 – 182, 183, 184, 185 16 – 988, 999 19 – 802,850,851 30 – 105, 211, 212, 219, 220, 31 –102,104, 105, 32 –310, 42 - 129	Blasting according to SIS 055900 GRADE: SA 2 1/2	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30m per coat	--	--	--	--	Red Oxide	60

3.5	8A	Uninsulated Fuel Pipes 47 – 229, 265, 266, 267, 268, 269 Duct for Tube Mill: 48 – 802, 804, 812, 814, 817, 822, 824, 832, 834, 842, 844, 852, 854, 857, 862, 864, 867, 872, 874, 882, 884,	Blasting according to SIS 055900 GRADE: SA 2 1/2	General purpose Aluminium paint to IS 2339	2	--	--	--	--	Alumun um	40
-----	----	--	--	--	---	----	----	----	----	--------------	----

SL. No.	Schem e No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat at site		Finish coat at site			Total DFT µm (min)
				Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
4	15	Constant Load and Variable Load Hangers (CLH / VLH) (See NOTE 14) 07 - 401, 410, 420, 431 10 – 200 17 – 904, 919, 19 –904, 905, 906, 907 24 - 351	Blasting according to SIS 055900 GRADE: SA 2 1/2	Epoxy zinc rich primer to IS 14589 Gr. II %VS=35 (min)	1 DFT=40 m / coat	--	--	Aliphatic acrylic Poly- urethane paint %VS=40 (min) t	1 DFT=30 m per coat	Phirozi Blue Shade No. 176 of IS5	70
5.1		Miscellaneous and Casing Sheets: 07-500, 501, 601, 997, ,21 - 601, 24 - 201, 225, 235, 240, 350, 470, 471, 473, 501, 525, 535, 540, 570, 601, 625, 635, 640, 800, 801, 815, 850, , 36 - 613, 37 - 010, Fuel Firing: 41 –350, 390, Steam Blowing Piping: 42 – 002, 005, 010 42 –065, 070, 120,152, 154, 157, 43 –, 004, 005, 45 –220, 221,47 –201, 209, Duct Plates and Expansion Joints: 48 –012, 014, 112, 114, 142, 144 Coal Handling: 65 –736, 276, 283, 801, 802, 803,	Blasting according to SIS 055900 GRADE: SA 2 1/2	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	1 DFT= 30m per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20	Smoke Grey Shade No: 692 of IS 5	70
5.2	3	Erection Materials and Commissioning Components: 04 - 988, 05-993, 06-993, 07 – 993, 12-993, 24 – 993, 28 – 993, 35 – 993, 36 – 993, 37 – 993, 38 – 993, 39 – 993, 48- 993, 65 – 988, 97-585,99 – 045, 099, 501, 50	Blasting according to SIS 055900 GRADE: SA 2 1/2	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	2 DFT= 30m / coat	--	--	--	--	Red Oxide	60

SL. No	Scheme No.	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat at site		Finish coat at site			Total DFT μm (min)
				Paint	No. of coats	Paint	No. of coats	Paint	No. of coats	Shade	
6.1	10	Cast carbon steel valves (Conventional) Cast alloy steel valves (Conventional) All API valves, QCNRV, SV & SRV Silencers, Water Level gauge HP / LP system 22-101,889	Blasting according to SIS 055900 GRADE: SA 2 1/2	Resistant Aluminium Paint to IS 13183 Gr.I	2	--	--	--	--	--	40
6.2	--	Forged valves	Blasting according to SIS 055900 GRADE: SA 2 1/2	Coating weight of 1500 mg per sq.ft.	--	--	--	--	--	--	--
6.3	1AS	Soot Blower components 20-001,003,004,021,051,054,201,204,301,304,331,511,794,801,821,831,962,972	Blasting according to SIS 055900 GRADE: SA 2 1/2	Red Oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	1 DFT= 30m per coat	--	--	Synthetic Enamel paint (Long Oil Alkyd) to IS 2932	2 DFT= 20	Verdigris Green Shade No. 280 of IS5	70
6.6	8A	Hand Wheels	Blasting according to SIS 055900 GRADE: SA 2 1/2	General Purpose Aluminium Paint to IS 2339	2 DFT= 100m per coat	--	--	--	--	--	40

PS for Arrows shall be as per valves and the final shade will be „Post Office Red-Shade No. 538 of I

NOTES:

1. This painting scheme covers a comprehensive list of PGMA's being used in 125 / 150/ 210 / 250 / 500 MW and Industrial Boilers under Fossil Boilers working in normal environment, in an effort to standardise the painting scheme. Therefore, the entire list of PGMA's will not be applicable for any specific project and only those PGMA's applicable for the project may be used, while choosing the painting scheme applicable.
2. Rust Preventive coating should be given on HSFG Bolt and Nut threads at site.
3. All threaded and machined surfaces & Retainers are to be applied with a coating of Temporary Rust Preventive oil.
4. All surfaces of foundation materials, insulation pins, Anchor channels, Sleeves shall be coated with Temporary Rust Preventive Fluid and during execution of civil works; the dried film of coating shall be removed using organic solvents at site.
5. PGMA's under Sub-Vendor items are not indicated. Please refer respective Engineering Document for all sub-vendor items. Wherever it is not specified, it shall be as per the painting scheme of the applicable PGMA.
6. No painting is required for Aluminium, Stainless Steel components and galvanized items. Abrasive blast cleaning to SSPC-SP6 (Sa 2) grade shall be done to prepare the surface of hot worked pipes prior to application of primer.
7. Wherever inside surfaces of components under PGMA 48 – XXX, need protection till erection, and all running meter items for spares and main item two coats of Red-oxide zinc phosphate primer paint to IS12744 to a DFT of 60 microns shall be applied, after power tool cleaning. For items meant for Spares and subcontracting where no further processing is involved, the painting scheme selected shall be the same as that of similar product configuration/ description.
8. The Temporary Rust Preventive coating that has already been applied on any component, tubes, pipes etc., shall be visually inspected for good adherence. If the coating is intact, direct coating of alkyd-based paints over the coating is permitted. In case, the coating has peeled off over a large area, then the coating is to be removed by suitable solvents / heating to 350 –400 C for an hour before primer paint application –but, in this case, it should be ensured that the minimum surface cleanliness required for primer paint application shall be SSPC – SP2 (equivalent – Hand Tool cleaning).
9. All currently active PGMA's are covered. Requirements for Missing / new PGMA s will be included under the relevant section, following the appropriate paint logic.
10. Ground shade/colour finish paints & identification tag/ band for equipment's, piping, pipe service, boiler supporting structures and other boiler components shall be followed as per tender.
11. In components, wherever plates/sheets of thickness less than or equal to 5 mm, tubes/ rods/drain pipe are used, power tool /hand tool cleaning to SSPC-SP3/ SSPC-SP-2 shall be followed and the painting shall be done as described in SI no: 5.1.
12. Touch-up painting of damaged areas shall be carried out as per clause applicable painting scheme.
13. Only weldable primer shall be applied on surfaces, which require to be welded subsequently at site. At those locations no other paint shall be applied.
14. DUs coming under Constant Load Hangers (CLH) shall be painted as per the system - PS 15 indicated in SI. No. 4 of the table. However, for DUs coming under Variable Load Hangers (VLH), the painting shall be as per Painting Scheme PS 1A indicated in SI. No. 5.1 of the table. (i.e., one coat of Zinc Phosphate Primer followed by two coats of Synthetic Enamel Paint –shade smoke grey, total DFT – 70 microns)
15. For internal protection of Pipes, tubes, headers and other pressure parts, Volatile Corrosion Inhibitor (VCI) pellets shall be put (after sponge testing/ draining/ or drying) and subsequently end capped. The dosage of VCI pellets shall be approximately 100 gm/ Ch.M. For tubes typically 4 – 5 tablets per end are to be put. For C & I items the dosage of self-indicating Silica Gel (colourless) shall be 250 gm/ cu.m. (About 2 to 3 bags weighing approximately 100 grams each) . VCI pellets shall not be used for stainless steel components and its composite associates.
16. All threaded components of spring assemblies and turnbuckles shall be galvanized and achromatized to 15 microns minimum thickness.
17. Painting scheme for all temporary structures shall be PS 1AE i.e. 1 coat of Zinc Phosphate primer (Alkyd Base) to IS 12744-DFT-30 and 2 coats of Synthetic Enamel paint (Long Oil Alkyd) to IS 2932-DFT-2X20 Shade Yellow –Shade No. 356 of IS 5- Total DFT 70.
18. One no. of primer to be coated at shop only. Balance primer, intermediate or finish paint to be coated at site only.
19. The matching faces of HSFG Bolt connections should not be painted (If required rust preventive temporary coating can be applied to the max DFT of 30 µm)

Painting Scheme – Details for procurement & application purposes

Sl. No	Material Code of Paint	Generic nature of paint	Theoretical Covering Capacity Sq. m per Litre	No. of pack	Volume solids, % (min) **	DFT in microns (min) per coat	Shade	Shade No. to IS5	Mode of appln	Over coating interval, Hrs.
1	120016131800	Heat Resistant Aluminium paint to IS 13183 Grade I	10	1	-	-	Aluminium	-	Brush / Spray	24
2	120011111900	Red oxide Zinc Phosphate primer paint to IS 12744	10	1	-	-	Red Oxide	-	Brush / Spray	12
3	120011121900	Red oxide Zinc Phosphate Dip coat primer paint to PR: CHEM: 09-03	10	1	-	-	Red Oxide	-	Dip	12
4	120011311200	Long oil alkyd synthetic enamel finish paint to IS2932	10	1	-	-	Reqd. shade	Corrpdg. Shade no.	Brush / Spray	12
5	120011140000	Temporary Rust preventive fluid to PR: CHE: 09 – 04	10	1	-	-	Amber	-	Brush / Spray	12
6	120012141700	Epoxy Zinc rich primer to IS14589 Gr. II	8	2	35	40	GREY	-	Brush / Spray	24
7	120013310200	Aliphatic acrylic polyurethane paint to IS13213	10	2	40	30	Phirozi – Blue. /French Blue	176/166	Brush / Spray	24
8	120017101800	De Oxy Aluminate Weldable Primer- Colour Aluminium	10	1	-	-	Aluminium	-	Brush / Spray	24
9	120014111700	HB CR Based Zinc Phosphate Primer	10	1	40	50	GREY	-	Brush / Spray	12
10	120014300100	CR Based Finish Paint	10	1	30	30	French Blue	166	Brush / Spray	12

11	12001213800	High Build Epoxy Mastic Aluminium Primer-	10	1	80	100	Aluminium	-	Brush / Spray	24
12	180030810000	Inorganic zinc silicate	8	2	57	65	Grey	-	Spray	12

The covering capacity of paints specified is only approximate.

The paints and Rust Preventive fluid shall be procured from BHEL"s approved suppliers. ** Values are indicative.

BHARAT HEAVY ELECTRICALS LIMITED
TIRUCHIRAPPALLI - 620 014 (INDIA)

STANDARD QUALITY PLAN FOR
TUBULAR PRODUCTS

SQP: PP: 08 / 09

Page 1 of 20

Prepared by
Quality Assurance

V. Sampath Kumar
V. Sampath Kumar

Reviewed by	Signature
Engineering (K. Ravishankar)	<i>K. Ravishankar</i>
Manufacturing Shops (U. Reví sankaran)	<i>Revishankar</i>
O P & C (K. Srinivasan)	<i>K. Srinivasan</i>
Quality Control (M.V.Selvan)	<i>M.V.Selvan</i>
Quality Assurance (S. Selvarajan)	<i>S. Selvarajan</i>

Revision No.	Date	Approved by	Signature
00	01/04/93	SM / QA	
01	08/11/93	DGM / QA	
02	20/01/95	SM / QA	
03	15/07/96	SM / QA	
04	10/09/03	SDGM / QA	
05	31/12/05	DGM / QA	
06	31/12/07	C. R. Raju SDGM/QA	
07	23/01/10	V.Ravi Kumar SDGM/QA	
08	19/09/11	V.Ravi Kumar AGM/QA	
09	11/06/13	V.Ravi Kumar AGM/QA	<i>V. Ravi Kumar</i>

Proprietary Data - For Internal Use Only

BHEL	SQP: PP:08/09	Page 2 of 20
RECORD OF REVISIONS		
Rev.No.	Details of revision	Remarks
00	This SQP has been prepared by merging the documents listed in the Remarks column.	SQP 09/00, QCP 2:2:018/01, QCP 2:2:024/04, QCP 2:2:042/03 QCP 2:2:075, QCP 2:2:455, QCP 2:5:314 & HT SCHEDULE Table 8,9,10
01	Document revised based on comments from QC, Shop and OP&C etc. Requirements altered mainly in Tables of Heat treatment for forming & PWHT and in NDE. Editorial corrections made to rearrange clause Nos. and notes.	
02	Totally revised based on feedback from OP&C, Shop and QC.	
03	Cl. 2.1, 2.6.2 & 2.6.4 modified. Notes 1.0 & 2.2.1 Modified to include Steel 20 and update the TDC numbers. Notes 9.7 & 9.9 deleted. Note 9.8 renumbered as 9.7. Amendment A1 dt. 11.09.95 and A2 dt. 20.03.96 merged with this revision. Steel 20 material included in Tables 1 & 2. PR:QEs replaced with SIPs as applicable.	
04	Clauses 2.5.2, 2.5.4, 2.5.5, 2.5.8, Notes 2.1, 2.2, 2.4.3, 2.5, 2.8.1, 2.8.2, 4.0 & Table 2 of Note 9.0 modified. Clause 2.3.2 modified incorporating Amendment A3 dt. 07.04.2000 issued for Rev. 03. Clause 2.5.9.4 added. Amendment A2 dt. 05.06.97 issued for Rev. 03 incorporated in Table 1 of Note 2.0. Notes 10.1 & 10.1.1 modified and 10.1.2.1 added based on Amendment A1 dt. 01.11.96 and Amendment A4 dt. 23.01.2002 issued for Rev.03	
05	Editorial corrections in Clauses 2.2.2, 2.5.1, 2.5.2, 2.5.3 to 2.5.6, 3.2 & 3.3. Clauses 2.6.5 & 2.6.6 modified for clarity. Note 1.0 – TDC Nos. updated. Table 1 Amended to modify the HT requirements (based on Amendments A1 & A2 issued) for SS & T91 bends after cold bending. Also, HT requirement for T91 tubes after cold swaging altered. Note 2.2 under Table 1 - Range of temperature For CDF altered. Note 2.4.3 deleted. Table 2 – Note modified to change the PWHT cycle for burner panel. Minimum SR temp. For ASME jobs (P4 material) altered in Tables 1 & 2.	
06	Amendment A1 dated 05.01.2007 is merged with this revision. Note 2.3 is modified Note 2.4.2 is removed as it is already covered in Table-I and Note- 2.4.1 is merged with Note 2.4. A new Note-2.9 is added for hardness value of AS & SS tubes. A new Note 2.10 is added for bifurcates. A new Note-2.11 is added for PEMA panel's heat treatment before pullout. PWHT requirement for the welds between support members (Lug-to-Lug) in tube supports has been added as a new Note 10.0. Existing Notes 10.0 to 11.1 are renumbered as Notes 11.0 to 12.1.	
07	1. For clauses 2.6.1& 2.6.5, Note 4.0 also added as a reference document. 2. For clause 2.7, Note 10.0 & table 3.0 also added as a reference document. 3. In note 1, for tubes, New materials T23 with UNS number as per ASME sec I, Super 304 as per code case 2328-1, T92 as per code case 2179-7 included. 4. Based on the revision made in addenda of ASME 2009b, sec I, PG 19, point 3, the solution annealing for the P8 group products in note 2 is revised for the R/D factor and split into two specifications. 5. In all the places of Pno 5B group 2 is changed to P15 E as per the record number of 06-780 of ASME sec I. 6. In note 2, table 1, P3 group 2 for T2 is changed to P3 group-1 T2. (Editorial correction). Also T23, T92 and Super 304 included. 7. In Clause 2.2, soaking time for solution annealing for super 304 included. 8. Clause 2.8 modified mentioning the annealing temperature. 9. In clause 2.9, Hardness values for T2, T23, T92 and Super 304 introduced. Also stainless steel removed and all the materials mentioned. 10. P15 E also included in the table 3.0.	

08	1. Clause 2.1 quantum of check for dimensions changed 2. Clause 2.5.4 activated TIG added. 3. Clause 2.5.6 deleted and subsequent numbers updated. 4. Clause 2.5.6, format of record changed. 5. Clause 2.5.6 and 2.5.7 remarks removed. 6. Clause 2.6.2, transverse word added before flatness of the characteristics for better clarity. 7. Clause 2.6.8, type of check modified, quantum of check changed and remarks removed. 8. Spectro test added in clause 3.2. 9. Note 9.2, 9.6, modified. 10. Note 2.12 included. 11. Table 1, changed based on the code requirements and some notes have been added after table 12. Table 2 and table 3 changes made for P15E group 1. Gr T92 & T23 Included. 13. Notes after table 2.0 modified.
09	1. Amendment – A1 & A2 details included. Already released amendment A2 modified and added. 2. Remarks of 2.6.2 modified. 3. Note 2.10 – Revised for clarity 4. Spectral test in clause 3.2 has been changed to Spectro. 5. Note 11.1.1 (ii) & (iii) – Merged and revised Rest of the sub notes renumbered. 6. Note 11.1.2 – Revised 7. Table-2 – Revised 8. Table-1 – Cold working parameters for P15 E Group1, T23 and SS materials modified as per ASME. Also point C of \$ added under table I. 9. Note 9.6 modified. 10. Note 9.8 – Added.

SL.	COMPONENT &	CHARACTERISTICS	CLASS	TYPE OF	QUANTUM	REFERENCE	ACCEPTANCE	FORMAT OF	AGENCY			REMARKS
NO.	OPERATIONS			CHECK	OF CHECK	DOCUMENT	NORMS	RECORD	M	C	N	SQP:PP:08/09 Page 4 of 20
1	2	3	4	5	6	7	8	9	D*	**	10	11

1.0	MATERIAL											
1.1	Tubes	Chemical & Mechanical Properties, Soundness	A	Review of documents	100%	Material procured as per TDC to specification indicated in Drawing.	TC	QC				See Note :1.0
1.2	Plates, sheets & bars, Fittings	Chemical & Mechanical Properties	A	Review of documents	100%	Material procured as per TDC to specification indicated in Drawing.	TC	QC				See Note :1.0
2.0	INPROCESS (Refer QCP:004 (Latest) for process control requirements)											
2.1	Marking, cutting & Preparation	Edge preparation	B	Visual, Dimensions	100%*	Cutting plan/ Drawing	R	QC				*FOI shall be done for each setting.
2.2	PROCESS QUALIFICATION											
2.2.1	Bending, Hot Squeezing and sizing	Thinning, Ovality, Flow Area	B	Measurement	Set of three	Drawing & SIP:PP:12	R	QC				Only in case where FOT has not been done already
2.2.2	Swaging	OD, ID, Hardness	B	Measurement	-do-	Drawing & SIP:PP:12 & Note 2.8 & Note 2.9	R	QC				
2.2.3	Welding	Procedure Qualification	B	Review of documents	100%	ASME Sec. IX	WPS	QC				To be qualified if the existing qualification does not meet the requirements
		Personnel Qualification	B	Review of documents	100%	IBR/ASME Sec. IX	WQR	QC				
2.3	Forming	SEE NOTE 2.0 FOR PROCESS CONTROL										
2.3.1	Heating & Heat Treatment	Time/Temp Control	B	Review of HT Charts/log/ movement sheet	100%	Note 2.0, Table 1	R	QC				

LEGEND : CI: Class (A: Critical B: Major , C: Minor) * D : Records for Data folder ** M : BHEL C : Customer N : TPI agency QC : Quality Control ND: NDT Lab. R : Record

SL.	COMPONENT &	CHARACTERISTICS	CLASS	TYPE OF	QUANTUM	REFERENCE	ACCEPTANCE	FORMAT	AGENCY			REMARKS
NO.	OPERATIONS			CHECK	OF CHECK	DOCUMENT	NORMS	RECORD	M	C	N	SQP:PP:08/ 09 Page 5 of 20
1	2	3	4	5	6	7	8	9	D*	**	10	

2.3.2	Tube bends, Swaged Ends & Bifurcates	Surface quality Dimensions	B	Visual Measurement	100% 10%	Free from damages Drawing	R	QC				Refer Note 4.0
2.3.3	Inspection of Swaged ends	Hardness Surface Quality	B	Measurement NDE-LPI	10% 10%	Note 2.8 & 2.9 BHE:NDT:PB:PT-01	R R	QC ND				After HT
2.4 Preproduction Trials for machine welding												
2.4.1	Induction Pressure Welding	Weld Bond	B	Bend Test/ Cold Impact	As per SIP:PP:13	SIP:PP:13	R	QC				
2.4.2	Flash Butt welding	Weld Bond	B	Bend Test	As per SIP:PP:14	SIP:PP:14	R	QC				
2.4.3	Studding	Weld Bond	B		See Note 3.0		R	QC				
2.5 Weld Inspection												
2.5.1	Straight Tube Butt welding	Weld Quality Finish	A C	Fluoroscopy Visual	100% 100%	BHE:NDT:PB:FT-01 SIP:PP:03	R	ND QC				
2.5.2	IPW	Weld Quality Finish	A C	NDE-UT Visual	100% 100%	BHE:NDT:PB:UT-01 SIP:PP:03	R	ND QC				
2.5.3	FBW	Weld finish inside Diameter	C B	Visual Ball Test	100% 100%	SIP:PP:03 SIP:PP:15	R	QC				
2.5.4	Orbital TIG/ Activated TIG	Weld Quality Weld finish	A C	NDE-RT Visual	100% 100%	BHE:NDT:PB:RT-01 SIP:PP:03	R	ND QC				
2.5.5	GTAW or GTAW+SMAW	Weld Quality Weld finish	A C	NDE-RT Visual	100% 100%	BHE:NDT:PB:RT-01 SIP:PP:03	R	ND QC				
2.5.6	Fusion welded panels and I Pass OTSC panels	Weld Quality Ball Passage	C B	Visual Ball Test	100% 100%	SIP:PP:03 SIP:PP:15	R	QC				

LEGEND : CI: Class (A: Critical B: Major , C: Minor) * D : Records for Data folder ** M : BHEL C : Customer N : TPI agency QC : Quality Control ND: NDT Lab. R : Record

SL.	COMPONENT &	CHARACTERISTICS	CLASS	TYPE OF	QUANTUM	REFERENCE	ACCEPTANCE	FORMAT OF	AGENCY			REMARKS
NO.	OPERATIONS			CHECK	OF CHECK	DOCUMENT	NORMS	RECORD	M	C	N	SQP:PP:08/ 09 Page 6 of 20
1	2	3	4	5	6	7	8	9	D*	**	10	11

2.5.7	Flat Fin welded panels	Weld Quality	C	Visual	100%	SIP:PP:03	R	QC			
2.5.8 Attachment Welds											
2.5.8.1	Peg Fin Welding	Weld Quality	C	Visual& Hammer Test	100% 10%	SIP:PP:03 #	R	QC			# No breakage when struck with 250 g Hammer
2.5.8.2	Stud Welds	Weld Quality	C	Hammer Test & Visual	10% 100%	Note 3.2 SIP:PP:03	R	QC			
2.5.8.3	Structural Attachments	Weld Quality	C C	Visual NDE-LPI/MPI	100% 10%	SIP:PP:03 BHE:NDT:PB:PT-01/MT-01	R R	QC ND			
2.5.8.4	Finned Economizer	Weld Quality	C	Visual	100%	SIP:PP:03	R	QC			
2.6 Dimensional Control											
2.6.1	Straight panels	Length, width Opening location, Orientation, bow, EP	B	Measurement	100%	Drawing and Note 4.0 &5.0	R	QC			*Only Tension side of bend portion if R/D <2.5 @FOI& further 10% layout. \$ Measurement if terminal dimension given
2.6.2	Gang bent panels	Length, Angle, EP, Transverse flatness, Surface quality	B	Layout check NDE-LPI*	100% 10%	Drawing ≤12.5 mm BHE:NDT:PB:PT-01	R R	QC ND			
2.6.3	Bank Tubes	Dimension, Angle	B	>10 Nos. Layout ≤10 Nos. Measurement \$	10% @ 100%	Drawing	R	QC			
2.6.4	Wall RH panel	Length, width, Bow, Bore, EP	B	Layout Check Measurement	10%	Drawing and Note 5.0	R	QC			

LEGEND : CI: Class (A: Critical B: Major , C: Minor) * D : Records for Data folder ** M : BHEL C : Customer N : TPI agency QC : Quality Control ND: NDT Lab. R : Record

SL.	COMPONENT &	CHARACTERISTICS	CLASS	TYPE OF	QUANTUM	REFERENCE	ACCEPTANCE	FORMAT OF	AGENCY			REMARKS
NO.	OPERATIONS			CHECK	OF CHECK	DOCUMENT	NORMS	RECORD	M	C	N	SQP:PP:08/09 Page 7 of 20
1	2	3	4	5	6	7	8	9	D*	**	10	11
2.6.5	Burner panel	Length, openings, Flange straightness & bend	B	Measurement	100%	Drawing, Note 4.0 and 6.0		R	QC			Fixture shall be inspected.
2.6.6	Scalloped Bar	Dimensions	B	Measurement	10%	Drawing, Note 7.0		R	QC			
		Weld Quality	C	/Layout Check NDE-LPI	10%	BHE:NDT:PB:PT-01		R	QC			
2.6.7	Coils and Elements	Terminal dimension, EP, Pitch, Orientation	B	Conformance to fixture	100%	Drawing Note 8.0		R	QC			
2.6.8	Loose Tubes	Dimensions, Angle, Bore Diameter	B	Measurement /Layout	10%	Drawing & Note 8.0		R	QC			
2.7	PWHT	Time/Temp Control	A	Review of charts/log	100%	Note 9.0 & Table 2 Note 10.0 & Table 3		R	QC			
2.8	Butt welds (T23)	Soundness	A	Hardness	10%*	150-331 BHN		R	QC			*Per PGMA
3.0 Final												
3.1	Hydraulic Test	Strength & leak tightness	A	Visual	100 % \$	Drawing & SIP:PP:04		R	QC			\$ See Note 11.0
3.2	Final Inspection	Free from Damages	B	Visual	100%	Drawing		-	QC			
		Passage Freedom		Sponge Test Visual	100%	SIP:PP:15		R	QC			

LEGEND : CI: Class (A: Critical B: Major , C: Minor) * D : Records for Data folder ** M : BHEL C : Customer N : TPI agency QC : Quality Control ND: NDT Lab. R : Record

SL.	COMPONENT &	CHARACTERISTICS	CLASS	TYPE OF	QUANTUM	REFERENCE	ACCEPTANCE	FORMAT	AGENCY			REMARKS
NO.	OPERATIONS			CHECK	OF CHECK	DOCUMENT	NORMS	RECORD	M	C	N	SQP:PP:08/09 Page 8 of 20
1	2	3	4	5	6	7	8	9	D*	**	10	11

3.3	Painting	VCI & End Capping	B	Visual	100%	SIP:PP:22	-	QC			# For Alloy steels
		Identification: Colour Code, WO details, Top/Bottom identity		Visual	100%	Drawing	R	QC			
		Spectro test #		Spectro#	100% #	Drawing Specn	R	QC			
		Paint Finish, DFT	C	Visual Measurement	100% Random	SIP:PP:22	- R	QC			
3.4	Packing and Crating	Protection & stability	C	Visual	100%	Drawing & Packing procedure as applicable	-	QC			
3.5	Certification	Code Compliance	B	Compilation of records	100%	IBR and Note 12.0	R	QC			

LEGEND : CI: Class (A: Critical B: Major , C: Minor) * D : Records for Data folder ** M : BHEL C : Customer N : TPI agency QC : Quality Control ND: NDT Lab. R : Record

NOTE 1.0 The Materials normally used and their TDC Nos. are given below:

MATERIAL	SPECIFICATION	TDC NO.
Tubes	SA 192, SA 210 Gr. A1, Gr. C, SA 209 Gr. T1, SA 213 Gr. T2, T11, T12, T22, T91, SA 213 TP 304H, 316, 321, 321H & 347H	0:102, 0:111,
	SA312 TP316	As per specification.
	Super 304 (S304 H), SA 213 T23, T92	0:124
	GOST 12X1MΦ, Steel 20	0:103
Rifled tubes	SA 210 Gr.A1, Gr. C	0:105
Wear bars	IS 2062, SAE 1070	As per specification.
Bars	SA 182 F12, F22	As per Specification.
Plates	ASTM A36	0:301
	ASTM A576 Gr. 1008 to 1016	0:303
	SA 387 Gr. 12, Gr. 22, SA 588 Gr. A SA 240 TP 304, 310, 309, 309S	As per Specification.
	IS 2062 Gr A, Gr. B, IS 1875 Gr. 2, IS 1079 St. 34	
Fittings/Forgings	SA182 F12, F22, F23, F91	0:404

NOTE 2.0 FORMING

2.1 Bending and swaging can be done cold or hot. Cold working means operation carried out below 590 deg.C. The temperature for bending, swaging and subsequent heat treatment is detailed in Table 1.

TABLE 1: COLD AND HOT WORKING OF TUBULAR PRODUCTS

Material	COLD WORKING (TEMP < 590°C)		HOT WORKING			
	Cold Bending	Sizing, Squeezing Swaging & Upsetting	Hot Bending	Sizing & Squeezing	Swaging & Upsetting	Hot correction
P1Group1&2 SA178 A,C, SA192, SA210 GrA1, Gr C Steel 20	R/D<=1.3 or t > 19mm SR 610 +/- 15°C @@	SR at 610+/-15 °C (Anneal if required see note 2.8)	Hot bend at 870-900°C ** SR - Nil	Hot form at 790-950°C SR - Nil	Hot form at 790-950°C SR - Nil	Hot Correct at < 950°C [650 °C if welds are involved]

Material	COLD WORKING (TEMP < 590°C)		HOT WORKING			
	Cold Bending	Sizing, Squeezing	Hot Bending	Sizing & Squeezing	Swaging & Upsetting	Hot correction
P3 Group 1 SA209T1	All bends SR 635+/-15°C	SR at 635+/-15°C (see note 2.9)	Hot bend at 870-900°C All bends SR at 635+/-15°C	Hot form at 790-950°C SR - Nil	Hot form at 790-950°C SR - Nil	No SR if Hot Correct # at < 720°C. Else SR at 635+/- 15°C
P3 Group 2 SA213T2 P4 Group 1 SA213 T11, T12	R/D<2 or t>13mm SR 655+/-15°C for fin welded panels if R/D < 3	SR at 655+/-15°C (see note 2.9)	Hot bend at 870-900°C R/D < 2 SR at 655+/-15°C	Hot form at 790-950°C SR NIL	Hot form at 820-1090°C SR 655+/-15°C	No SR if Hot Correct # at < 720°C Else SR @655+/-15°C
Minimum SR temperature shall be 650 deg C for ASME jobs.						
P5A Group1 SA213 T22	R/D<2 or t>13mm SR 695+/-15°C	SR at 695+/-15°C (see Note 2.9)	Hot bend at 870-900°C All bends SR at 695+/-15°C	Hot form at 790-980°C SR 695+/-15°C	Hot form at 850-1090°C SR 695+/-15°C	Hot Correct# at < 760°C ,no HT. if > 760,SR at 695+/-15°C
12X1MΦ	R/D<2 or t>13mm SR 745+/-15°C	SR at 745+/-15°C	Hot bend at 950-1100°C Normalize at 950-980°C & Temper at 745+/- 15°C	Hot form at 950-1100°C Normalize at 950- 980°C & Temper at 745+/-15°C	Hot form at 950-1100°C Normalize at 950- 980°C & Temper at 745+/-15°C	Hot Correct# at < 760°C ,no HT. if > 760,SR at 745+/-15°C

Material	COLD WORKING (TEMP < 590°C)		HOT WORKING			
	Cold Bending	Sizing, Squeezing	Hot Bending	Sizing & Squeezing	Swaging & Upsetting	Hot correction
P15E Group 1 SA 213 T91,T92	I) For Design Temperature ≤ 540 deg.C (A) R/D <2.5 SR at 745+/-15°C (B) R/D ≥ 2.5 , No HT. II) For Design Temperature >540 & ≤ 600 deg.C (A) R/D <2 - Normalize at 1040-1070°C & Temper at 745+/-15°C B) R/D ≥ 2 & <10 – SR at 745+/-15°C C) R/D ≥ 10 , No HT. III) For Design Temp. >600 deg.C (A) R/D <2.5 - Normalize at 1040-1070°C & Temper at 745+/-15°C B) R/D ≥ 2.5 & <10 – SR at 745+/-15°C C) R/D ≥ 10 , No HT.	Normalize at 1040-1070°C & Temper at 745+/-15°C	Hot bend at 950-1050°C Normalize at 1040-1070°C & Temper at 745+/-15°C	Hot form at 950-1050°C Normalize at 1040-1070°C & Temper at 745+/-15°C	Hot form at 950-1050°C Normalize at 1040-1070°C & Temper at 745+/-15°C	Hot Correct at < 760°C, no HT. if > 760 °C , Normalize at 1040-1070°C and Temper at 745+/-15
		1. Ensure the tube ends are covered by SS end caps during normalizing to avoid scaling. 2. Normalizing and tempering shall be done encompassing the entire component.				

Material	COLD WORKING (TEMP < 590°C)		HOT WORKING			
	Cold Bending	Sizing, Squeezing	Hot Bending	Sizing & Squeezing	Swaging & Upsetting	Hot correction
SA213 T23 (UNS K40712. Also grouped under P5Agroup1) \$	(A)R/D<2.5 & T<13mm (B)For T≥13mm Normalize at 1040-1070°C & Temper at 745+/-15°C (C)R/D≥2.5 to <10 & T<13mm – Refer below Note-D under T23 (D)R/D≥10 & T<13mm No HT.	Normalize at 1040-1070 °C & Temper at 745+/-15°C	Hot bend at 870-900°C Normalize at 1040-1070°C & Temper at 745+/-15°C	Hot form at 790-980°C Normalize at 1040-1070°C & Temper at 745+/-15°C	Hot form at 850-1090°C Normalize at 1040-1070°C & Temper at 745+/-15°C	Hot Correct at < 605°C, no HT. if > 605 °C, Normalize at 1040-1070 °C & Temper at 745+/-15°C
	Ensure the tube ends are covered by SS end caps during normalizing to avoid scaling.					
P8Group 1 SA213 TP304H SA213 TP316 SA312 TP316	R/D ≥2.5 No HT	Solution HT (see note 2.9)	Hot bend at 980-1120°C	Hot form at 980-1120°C	Hot form at 980-1120°C	Hot correct>980°C
	R/D < 2.5 Solution HT	Solution HT: 1040-1090 °C/15 minutes' minimum. Ensure the tube ends are covered by SS end caps during solution annealing.				
P8Group 1 SA213 TP347H Super 304 (S304 H)	R/D ≥ 3.33 No HT	Solution HT (see note 2.9)	Hot bend at 980-1120°C	Hot form at 980-1120°C	Hot form at 980-1120°C	Hot correct>980°C
	R/D < 3.33 Solution HT	Solution HT: 1100-1150 °C/30 minutes' minimum Ensure the tube ends are covered by SS end caps during the solution annealing.				

@@ For fin welded panel bending if R/D < 2.5, SR shall be done for all thickness

Temp. Shall not exceed the value given in this column, if weld joints are getting heated during hot correction

** 920 - 950 °C for Steel 20 materials.

\$ T23 (UNS K40712):

- (A) Soaking time for normalizing operation shall be as per QCP: 004 with a minimum of 15 minutes. The Component has to be cooled rapidly and continuously (Forced air draft) to 205 °C before tempering. Tempering shall be done for one hour per inch of thickness with minimum 30 minutes.
- (B) The entire tube containing the area to be heat treated must be normalized and tempered as a unit. Alternatively, the section requiring normalizing & tempering can be removed, heat treated and re welded into the component.
- (C) Tube bends made separately shall be heat treated as per the above table before the tubes being welded to the panel/coil.
- (D) If R/D≥2.5 to <10 and cold strained portion of the part is likely to be exposed to temperature between 720 to 1040°C during fabrication whether purposefully or incidentally (or) if a weld is to be made on the cold strained portion, then cold strained part shall be Normalized at 1040-1070°C & Tempered at 745+/-15°C after bending..

- 2.2 For SR /Tempering in CDF furnace the temperature ranges shall be as follows instead of +/-15°C shown in Table 1.

Steel 20, P1, P3 Grp 2, P4, P5 Grp 1	= +25 / -15°C
P3 Grp 1	= 620 - 660°C
P15E Group1, Gr.92, 12X1MΦ	= +/- 15°C

Soaking time shall be as follows:

Normalizing	- 1 minute/mm (15 minutes min.)
Tempering / Stress relieving (SR)	- 2.5 minute /mm with 15 minutes minimum for P1 and 30 minutes minimum for other ferritic materials.
Solution annealing	- minimum 15 minutes for 304H & 316 and 30 minutes for 347H & Super 304.

- 2.3 Inter stage Heat treatment shall be done at the same temperature and soaking time as SR for multi-stage cold swaging, squeezing and sizing.
- 2.4 Post forming heat treatment is exempted for all cold bends of P1 material for $t \leq 19$ mm $R/D > 1.3$ except gang bending of fin welded panels with $R/D < 2.5$.
- 2.5 Post forming heat treatment may be combined with final PWHT of welds. However this is not applicable in case of swaging and upsetting operations, except in cases where swaged / upset area is at the erection weld end or at least 300mm away from the shop weld end.
- 2.6 For the purpose of heat treatment, the R/D ratios can be rounded off to the nearest integer as given below.

Diameter (mm)	Bend Radius (mm)	R/D Ratio
38/38.1	75	2
42	80	2
44.5	90	2
51	100	2
51	151	3
54	105	2
54	159	3
60.3	120	2
63.5	190	3
76.1	225	3

- 2.7 Heating band for strip heated bends:

Heating shall be done on compression side
 Width : 50 mm minimum
 Length : 50 mm beyond the tangent points
 Temperature : As per Table 1

- 2.8 All swaged ends of carbon steel tubes after forming shall be process annealed as detailed below @ 680-720 deg C for 15 minutes minimum.

- 2.8.1 Swaged ends of carbon steel tubes meant for welding need not be annealed if the hardness is within 20% in excess of the following:

Material	Hardness Value
SA 210 A1	143 BHN
SA 210 C	179 BHN
SA 192	137 BHN (Thickness ≥ 5 mm)
SA 178 A	137 BHN
SA 178 C	143 BHN
Steel 20	143 BHN

- 2.8.2 Swaged ends of carbon steel material meant for bank tubes (undergoing expansion) shall be process annealed and the hardness ensured to be 120 BHN max. Process annealing shall be carried out at 680-720°C for 15 minutes minimum.

- 2.9 Maximum Hardness after swaging and Heat treatment in case of alloy steel tubes shall be as follows:

Material	Hardness Value
T1, T2, T11, T12, T22	163 BHN
T23	220 BHN
T91, T92	250 BHN
TP304H, TP 316, TP347H	192 BHN
Super 304 (S304H)	219 BHN

- 2.10 All bifurcate bends shall be stress relieved after pull out at temperature indicated in Table 1. Machining to be carried out before 3rd leg welding.
- 2.11 Panels made in PEMA shall be stress relieved at temperature indicated in Table 1 before pullout openings, if thickness is 7.1mm and above.
- 2.12 All panels meant for gang bending shall be stress relieved before bending at the temperature indicated in Table 1.

NOTE 3.0 PRE-PRODUCTION TRIALS FOR STUDDING

- 3.1 A sample tube of about 300 mm shall be studded using the qualified WPS, prior to production.
- 3.2 The welds shall be visually checked for all round fusion. Conduct hammer test using a 250g hammer. The studs shall not break at the weld. Insert a pipe to at least 2/3 of the depth of the stud and bend it by applying a steady manual load to the lever for 15°. Failure shall not occur at the weld.

NOTE 4.0 OPENINGS IN PANELS

- 4.1 The openings in panels for peep holes; wall blowers and instrument openings shall be made by pull out bends, wherever feasible. Inserts shall be provided only in unavoidable cases due to size change or location restrictions.

NOTE 5.0 STRAIGHT PANELS

- 5.1 Establish a reference line square to the edge of the tube at one end of the panel. Mark the panel with required length (specified length + 6 mm) square to the reference line. Transfer both lines to the rear side of the panel. All tubes short of line will be marked for extension.
- 5.2 The difference between the diagonal shall not be more than 5 mm for panels up to and including 10 m long, and 8mm for longer panels.

NOTE 6.0 BURNER PANEL

- 6.1 Ensure that temporary cross stiffeners are provided to minimise distortion during handling, HT and transportation. Stiffeners shall be welded on edge bars only.
- 6.2 Scallop bars profile and pitches shall be ensured as per drawing.
- 6.3 Cold side of fusion-welded panel shall be coincided with the cold side of burner panel.
- 6.4 The maximum permissible longitudinal bow shall be 12.5mm measured on edge bar plane and edge bar tip.
- 6.5 The wind-box frame straightness shall be within 5 mm for its full length after welding.

NOTE 7.0 SCALLOPED BARS

- 7.1 Scallop plates/sheets can be made from more than one piece when length exceeds 1.5 M, but minimum length of splicing shall be more than 500 mm.
- 7.2 Profile shall be checked by template of at least three profiles and two pitches.
- 7.3 Scallop bars having shapes shall be pressed to shape only after scalloping.

7.4 Tolerance on radius for manufacture of scalloped bar is ± 0.5 mm, individual pitch difference is ± 1 mm & cumulative pitch difference is ± 2 mm. However the profile has to be matched with the tubes during panel/coil assembly.

NOTE 8.0 COILS AND LOOSE TUBES

8.1 End out of squareness of terminal ends shall be ≤ 0.5 mm.

8.2 Tolerances for un-tolerance dimensions shall be:

Up to 1 metre : ± 1 mm
 Above 1 m & up to 5 m: ± 2 mm
 Above 5 metres : ± 5 mm

NOTE 9.0 POST WELD HEAT TREATMENT

Products of materials falling within the ranges indicated for each P No. in Table 2 below are to be heat treated in the temperature ranges shown.

**TABLE 2 : PRE HEAT & POST WELD HEAT TREATMENT TEMPERATURES (°C)
 FOR PIPES/TUBES OF OD ≤ 108 & t ≤ 19 mm**

Tube/Pipe Material	Thickness in mm	BUTT welds		Attachment welds			
		Preheat	PWHT	Fillet Length ≤ 100 mm		Others	
				Preheat	PWHT	Preheat	PWHT
P1 group 1 SA 178 A,C SA 192, SA 210A1, Steel 20	All	NIL	610+/-15 deg C For bifurcates and flash butt welds only	NIL	NIL	NIL	610+/-15 deg.C For Fusion Welded Panel, Burner panel** and attachments of throat >13mm only
P1 Group 2 SA210Gr C	1) T ≤ 9 & C $\leq 0.3\%$ 2) T > 9 to ≤ 20 & C ≤ 0.25	NIL	610+/-15 deg C For bifurcates and flash butt welds only	NIL	NIL	NIL	610+/-15 deg.C For Fusion welded Panel, burner panels** and attachments of throat >13mm only

Tube/Pipe Material	Thickness in mm	BUTT welds		Attachment welds			
		Preheat (PH)	PWHT	Fillet Length <=100mm		Others	
				PH	PWHT	PH	PWHT
P1 Group 2 SA210Gr C	3) T>9 to ≤20 & C>0.25 to ≤0.3% 4) All "T" if C > 0.3%	NIL	610+/-15 deg C	NIL	NIL	NIL	610+/-15 deg.C For Fusion welded Panel and attachments of throat >13mm only
P3 group 1	T≤13	NIL	635+/-15 deg C A) For IPW & B) For bifurcates	NIL	635+/-15 deg C For P8 attachments only.	NIL	635+/-15 deg C
	T>13	Nil	635+/-15 deg C	NIL	635+/-15 deg C For P8 attachments only.	NIL	635+/-15 deg C
P3 Group 2 P4 Group 1	T≤13	150	655+/-15 only 1) for IPW 2) for Bifurcates 3) if not pre heated	NIL	NIL	150	@@ 655+/-15
	T>13	150	655+/-15	Nil	Nil	150	655+/-15 deg C
	Minimum SR temperature for ASME jobs shall be 650 deg C.						
P5A group 1 OD≤102	T≤8	150	695+/-15 only 1) for IPW 2) for Bifurcates 3) if not pre heated	Nil	Nil	150	695+/-15 If throat >13mm or if not preheated.
	T>8	150	695+/- 15	Nil	Nil	150	695+/-15 deg C
SA 213 T91 SA 213 T92 SA213 T23	All T	220	745+/-15	220	745+/-15	220	745+/-15
		150		150	720-745(T23+Gr12 attachment)		720-745(T23+Gr12 attachment)

Tube/Pipe Material	Thickness in mm	BUTT welds		Attachment welds			
		Preheat (PH)	PWHT	Fillets Length <=100mm		Others	
				PH	PWHT	PH	PWHT
SA 213 TP304H SA213 TP316 SA312 TP316	All T	NIL	NIL	NIL	NIL	NIL	Solution annealing if throat >13mm at 1040-1090 deg C
SA213 TP347H Super 304							Solution annealing if throat >13mm at 1100-1150 deg.C

@@ For peg fin welds of P4, P5 fins, FW Panel, Fin welded Panel and All P8 attachments only. For all other attachments -only if not pre heated or if throat thickness is > 13mm.

** For PWHT of burner panels done in batch type furnaces. 510 ± 15°C cycles shall be followed with a soaking time of 25 minutes per mm of thickness

- 9.1 Heat treatment soaking time shall be as given in Note 2.2.
- 9.2 When scheduled for PWHT, pre heating is not required except for Gr.23, P15E group 1, Gr.92 and 12X1MΦ.
- 9.3 For butt welds of different P-number group combinations, PWHT temperature of higher P-number group shall be applied.
- 9.4 For attachment welds of different P group No. on Tubes, PWHT temperature of tube material shall apply. However for welding of Austenitic materials with ferrite materials, pre heat & PWHT of ferrite materials shall apply.
- 9.5 PWHT of stud welding shall be as per approved WPS.
- 9.6 PWHT of Bifurcate leg welding, except for Gr.23/ P15 E group1/Gr.92 group materials, can be clubbed with Heat treatment of assembly / panels. However, the combination of any of these Gr.23/ P15 E group1/Gr.92 can be clubbed together for PWHT.
- 9.7 When a number of attachments are welded to tube, each length of weld shall be separated from one another by a length of at least equal to the longer of the adjacent weld. Otherwise, total length of all such welds must be considered for PWHT.

9.8 Following options to be carried out for the below mentioned combinations.

SL NO	For Coil Assembly	
1	SA210 Gr C coil+ SA 213 T11/T12 hanger tube	Option A: - Coil bends only with R/D $\leq 1.3\text{mm}$ or $t > 19\text{mm}$, SR @ 610 ± 15 deg C separately. - Hanger tube attachment welding is done without preheating and PWHT carried out at 655 ± 15 deg C. - Now the heat treated bends and hanger tubes shall be used for coil assembly without further PWHT. Option B: - Hanger tube attachment welding is carried out without preheating. - Hanger tube and coil is assembled and as a whole assembly, PWHT @ 655 ± 15 deg C to be carried out.
2	SA 213 T23 coil+ SA 213 T11/T12 hanger tube	Option A: - Cold coil bends only with - R/D < 10 & T < 13 mm or - T ≥ 13 mm Normalize @ $1040-1070$ deg C, temper @ 745 ± 15 deg C to be carried out separately. - Hanger tube attachment welding is done without preheating and PWHT carried out at 655 ± 15 deg C. - Weld the joints of T23 and separately SR @ 745 ± 15 deg C. - Now the heat treated bends and hanger tubes shall be used for coil assembly without further PWHT. Option B: - Cold coil bends only with - R/D < 10 & T < 13 mm or - T ≥ 13 mm Normalize @ $1040-1070$ deg C, temper @ 745 ± 15 deg C to be carried out separately. - Hanger tube attachment welding is carried out without preheating. - Hanger tube and coil is assembled and as a whole assembly, PWHT @ $720-745$ deg C to be carried out.
3	SA 213 T23 coil+ SA 213 T22 hanger tube	Option A: - Cold coil bends only with - R/D < 10 & T < 13 mm or - T ≥ 13 mm Normalize @ $1040-1070$ deg C, temper @ 745 ± 15 deg C to be carried out separately. - Hanger tube attachment welding is done without preheating and PWHT carried out at 695 ± 15 deg C. - Weld the joints of T23 and separately SR @ 745 ± 15 deg C. - Now the heat treated bends and hanger tubes shall be used for coil assembly without further PWHT. Option B: - Cold coil bends only with - R/D < 10 & T < 13 mm or - T ≥ 13 mm Normalize @ $1040-1070$ deg C, temper @ 745 ± 15 deg C to be carried out separately. - Hanger tube attachment welding is carried out without preheating. - Hanger tube and coil is assembled and as a whole assembly, PWHT @ 745 ± 15 deg C to be carried out.

NOTE 10.0 PWHT requirement for the welds between tubes support are given in Table 3.

TABLE 3: PWHT requirement for the welds between support members (Lug-to-Lug) in tube supports (Not applicable for welds on tubes)

Material	P1 (Carbon Steel)			P4 (1 or 1.25 Cr, 0.5 Mo Steel)			P5A (2.25 Cr, 1 Mo Steel) & Gr. 23			P15 E Group 1 & Gr.92			P8 (Stainless Steel includes super 304)						
	Thickness	parameter	variable	Thickness	parameter	variable	Thickness	parameter	variable	Thickness	parameter	variable	Thickness	parameter	variable				
P1	P1<=38	Preheat	NIL	P4<=13 P1<=38	Preheat	NIL	P5A<=13 P1<=38	Preheat	150				P8 All P1<=38	Preheat	NIL				
		PWHT	NIL		PWHT	NIL		PWHT	NIL					PWHT	NIL				
				P4>13 &<=25 P1<=38	Preheat	120	P5A>13 &<=25 P1<=38	Preheat	150										
					PWHT	NIL		PWHT	695+/-15										
				P4>25 &<=38 P1<=38	Preheat	120													
					PWHT	655+/-15													
P4				P4 <= 13	Preheat	NIL	P5A<=13 P4<=25	Preheat	150				P8 All P4<=13	Preheat	NIL				
					PWHT	NIL		PWHT	NIL					PWHT	NIL				
				P4>13 &<=25	Preheat	120	P5A<=13 &P4>25& <=38	Preheat	150				P8 All P4>13& <=25	Preheat	120				
					PWHT	NIL		PWHT	695+/-15					PWHT	NIL				
				P4>25 &<=38	Preheat	120	P5A>13 &<=25 P4<=38	Preheat	150				P8 All P4>25& <=38	Preheat	120				
					PWHT	655+/-15		PWHT	695+/-15					PWHT	655+/-15				
				P5A & Gr 23							P5A<=13	Preheat	150				P8 All P5A<=13	Preheat	150
												PWHT	NIL					PWHT	NIL
P5A>13& <=25	Preheat	150																	
	PWHT	695+/-15												PWHT	695+/-15				
P15E Group 1 & Gr 92							All t	Preheat	220	All t	Preheat	220	All t	Preheat	220				
								PWHT	745+/-15		PWHT	745+/-15		PWHT	745+/-15				
P8 & Super 304													P8 All	Preheat	NIL				
														PWHT	NIL				

- For T23 welding, preheat is 150 deg C.

NOTE 11.0 HYDRAULIC TESTS

11.1 Hydraulic test shall be carried out as per SIP: PP:04 (latest) to the pressure specified in the drawing / SIP: PP:04, for the following:

11.1.1 All tubular assemblies such as:

- i) SOFA and Burner panels
- ii) Other Panels (100% for thickness ≤ 5.5 mm, 20% for thickness > 5.5 mm and < 7 mm, Nil for thickness ≥ 7 mm)
- iii) Economizer, Super heater & Reheater coils.
- iv) For loose tubes or loose bends, following table is applicable.

Length	Thickness of the Tube	Butt Weld	Butt weld cleared by FT/RT/UT as applicable	Attachment weld	Hydro
>1000 mm	T < 7 mm	√	√	√	100%
		X	X	√	100%
		√	√	X	Not Required
	T ≥ 7 mm	For all combinations			Not Required
≤ 1000 mm	All T	For all combinations			Not Required

11.1.2 All categories of spares involving butt or Attachment weld. When hydraulic test is not feasible due to practical constraints, hydro test can be substituted by 100% NDE of welds (provided Hydro test is not called for in the drawing).

NOTE 12.0 RECORDS

12.1. The following reports shall be maintained by QC:

FOT reports for forming, Dimensional/inspection reports, All material attestation cards, All NDE, Heat treatment, Hydro test reports, as applicable and Ball / Sponge test details.

#####